THE UNIVERSITY OF ALBERTA

RELEASE FORM

NAME OF AUTHOR   Rita Foon Nui Chow

TITLE OF THESIS   Model Working Life Tables: Theory and

Applications

DEGREE FOR WHICH THESIS WAS PRESENTED   Master of Arts

YEAR THIS DEGREE GRANTED   Fall 1982

THE UNIVERSITY OF ALBERTA

Model Working Life Tables: Theory and Applications

by

Rita Foon Nui Chow

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF Master of Arts

IN

Demography

Department of Sociology

EDMONTON, ALBERTA

Fall 1982

THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled Model Working Life Tables: Theory and Applications submitted by Rita Foon Nui Chow in partial fulfilment of the requirements for the degree of Master of Arts.

Abstract

iv

Various types of model tables are available in the demographic literature. This thesis represents an attempt to develop a system of model tables of labour force participation and working life for males and females using data obtained on a world wide basis. Regression techniques are employed in the development of age specific rates from crude labour force participation rates. The model rates thus developed in conjunction with the model life tables generate a system of model working life tables. Separate tables are available for males and females. Since the developed and the developing countries differ with regard to labour force participation, the tables are stratified on that basis. As mortality improves and the labour force participation rates increase, a shift in the age pattern of working life is noticed. For low levels of participation and low mortality, the age pattern of working life takes a different shape from that for high levels of participation and high mortality. Some applications of the model tables are also presented.

Acknowledgements

Special thanks are extended to Dr. P. Krishnan, my Supervisor, who has been a long-term source of inspiration. His continued guidance and encouragement have proven invaluable.

I owe my indebtedness to Dr. N. Lalu for his advice and assistance with the methodological aspects of this study. Without his help, many problems, especially in the computer-related work, could not have been solved.

Dr. W. McVey and Dr. R. Pendergast, who also served as committee members, have contributed greatly to this study. I have greatly benefited from their valuable suggestions and comments.

I would also like to express my gratitude to Dr. K. Krotki who gave me many thoughtful insights into the study of demography.

Finally, I wish to thank all the staff in the Population Research Laboratory for their assistance and the Department of Sociology of the University of Alberta for the financial support I recieved during my years of study. In addition, I sincerely thank Margaret Penning who kindly gave of her time to proof-read drafts of my thesis.

Table of Contents

List of Tables

ix

List of Figures

1. Introduction

Labour force plays a crucial role in the growth of a country's economy. Many studies have been carried out to investigate the composition of the work force in terms of demographic characteristics. An attempt has been made to develop a set of model age-specific labour force participation values by using regression techniques (Chow & Tse, 1981). This set of values will provide probable sets of age-specific rates of labour force participation when the participation rates at some age is known. How labour markets work and how well they perform their functions are not only matters of importance to those who participate in them; they are also vital to the performance of the entire economy (Burtt, 1979). A good indicator of the economic demographic situation in a country is the length of the working lives of its men and women, since this can reflect the potential contribution of the labour force to the national economy.

While the natural environment and the socio-economic institutions in a country are essential to the growth of the economy, the qualities of its people are the more important elements. Information on work force and length of working life is thus important and can afford valuable insights into a country's policies as well as into its future development. In order to monitor labour force conditions, regular labour

force surveys are being conducted in many countries. Many of these countries, however, do not have recent and detailed information on their work force and length of working life, and therefore they have to extract economic data on the labour force from census data alone. Censuses are an expensive undertaking and are carried out decennially in most countries. Hence, a dependable prediction of labour force activities would help the social and economic development of many countries.

Members of the labour force participate in the production and consumption of goods and services. They are the producers of a nation's income and the consumers of goods and services. (In conventional definitions, only the supply side of labour is considered.) Investigations of work force participation by demographic characteristics (e.g. age and sex) are necessary to assess how the labour markets work. While entry into the labour force is determined by fertility, mortality, market situation and recruitment policies which are all influenced by social norms, exit is shaped by retirement policies, market demands, and mortality conditions. Fertility and mortality changes influence the crude participation rate (CPR) largely through their effects on the age structure of the population. Decreasing fertility reduces the proportion of children and increases the proportion of adults in the population. Consequently, decreasing fertility tends to raise the CPRs by decreasing the proportionate share of

young workers and increasing the share of middle age workers in the labour force. Reduced mortality with unchanged fertility has the opposite effect of somewhat lowering the CPRs.

Entry into or exit from the labour force shows a sex differential. Economic conditions and social norms regarding the status of women determine the age pattern of their labour force participation. A detailed discussion of patterns of labour force participation is presented elsewhere in this thesis.

1.1 Objectives

The aim of this study is to develop a system of model tables of labour force participation (LFP) for both males and females from data gathered on a world wide basis. These sets of model tables can be used to generate meaningful estimates of work force participation, if some easily obtainable parameters of the economically active population are available.

Two types of tables are obtained:
1. Model tables of labour force participation rates; and
2. Model working life tables.

These sets of model tables can serve many important functions. These include:

1. estimation of the most probable working life expectancy (WLE) of populations for countries with incomplete data;
2. testing the accuracy of existing estimates of WLE;
3. indicating historical trends for countries with no available long-term data for computation of WLE over time; and
4. making labour force projections by using different levels of mortality and crude rates.

The rationale behind the methodology is discussed elsewhere in the thesis. With proper use of these sets of model tables, labour force conditions can be assesed for many countries of the world today. It is hoped that these model tables with necessary modifications may have wide applicability in many countries, especially those with no recent information on the labour force.

1.2 Thesis Plan

The plan of the thesis is as follows. In Chapter 2, the methodology behind the data analysis is presented. A review of the age patterns of labour force participation from the data is given in Chapter 3. Model tables of labour force participation are presented in Chapter 4.

Age-specific participation rates are estimated for different levels of crude participation rates with the help of the regression equations. In Chapter 5, model working life tables are discussed. The model tables are generated from the set of model age-specific work force participation rates in conjunction with the model life tables. Several applications of this approach for Canada and for countries having incomplete data are attempted in Chapter 6.

The summary and conclusions are given in Chapter 7. The general results are summarized along with suggestions for further research. In Appendix A, the construction of model working life tables and the functions of working life tables are discussed. Model working life tables for various levels of mortality and crude participation rates are shown in Appendices B and C.

2. Data and Methodology

2.1 Definitions

Definitions of some of the terms used in the thesis are given below.

2.1.1 Economically Active Population

The economically active population, according to the International Labour Office (ILO) (1978) definition, is the total number of employed and unemployed persons. These totals are derived from the latest census or survey of the country under consideration. The economically active population, therefore, comprises all those persons who contribute to the supply of labour for the production of economic goods and services, including not only those employed at the time of the investigation, but also those unemployed but available for work (United Nations, 1962:1).

2.1.2 Crude Participation Rate

The crude participation rate (CPR) is the total number of persons in the labour force divided by the total population and then, multiplied by one hundred. It is defined as the ratio of the total economically active population to the total population (ILO, 1978).

6

2.1.3 Age-Specific Participation Rate

The age-specific labour force participation rate (ASLFPR) is calculated by dividing the number of economically active persons in a specific age category of the population by the total number of persons in the same category and multiplying this number by one hundred (U.N.,1968:14).

A common practice for assessing the economic implications of variations in population age structure is to treat all those falling in the age group of 15-64 as labour force participants and all remaining people as dependents. The countries with high crude participation rates are usually those having a high proportion of their population in the age group 15 to 64. However, the most important factors to be considered are the age and sex specific LFPRs of a population.

2.1.4 Labour Force

Labour force is defined as the number of people who work for pay or profit or who are unemployed during any part of some short period of time, usually a week (Rees, 1973).

2.1.5 Working Life

The term "working life" refers to the average number of years of life that a person may spend in the labour force (Gnanasekaran & Montigny, 1971). The working life is not equivalent to the years of actual work because it may include periods of unemployment and part-time employment.

2.2 Data Source

The data on economically active population for mid-year 1975 compiled by the 1978 Year Book of Labour Statistics (ILO, 1978) have been utilized in this study. The data source consists mainly of information submitted by the statistical services of different countries or from official publications. For mid-1975, the data provide internationally comparable information on the total economically active population and sex-age specific labour force participation rates (LFPRs) for all countries, territories, and major geographical areas.

The data on LFPR take into account information on population and labour force obtained from national sources. However, the national data on labour force have been adjusted by the ILO to conform to a standard concept of labour force which comprises all employed and unemployed persons. It covers employers, own-account workers, employees, unpaid family workers, members of producers' cooperatives and members of the armed forces (ILO, 1978:15).

The analysis is based on data from 35 developed (including Israel and Japan) and 112 developing countries.[1] The geographical distribution of these countries is shown in Table 1. Since the developed and the developing countries differ in their age patterns of labour force participation, the analysis is done for each group of countries separately.

2.3 Theoretical Framework and Methodology

Historically, the need for constructing model tables in demography arose as a result of the lack of reliable information on vital statistics in many parts of the world. The patterns and the degree of relationships that existed between simple indicators and age-specific indicators in countries having reliable data were exploited to construct the model tables. The forerunner in this area was the United Nations (1955), followed by Coale and Demeny (1966).

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[1]In the classification of countries into developed or developing countries, we used GNP (gross national product) per capita as an indicator of the level of economic development. GNP is definable as "a dollar flow of total product for a nation; the sum of consumption plus investment (domestic and foreign) plus government expenditure on goods and services" (Samuelson & Scott, 1975:175). A country is broadly defined as developed if the per capita GNP of that country was $1,400 and above (in American dollars) in the year 1975.

TABLE 1

CLASSIFICATION OF COUNTRIES BY REGION

DEVELOPED REGION	NO. OF COUNTRIES
Northern America	2
Europe (including U.S.S.R.)	29
Oceania (excluding Fiji and Papua-New Guinea)	2
Israel	1
Japan	1
	TOTAL = 35

DEVELOPING REGION	NO. OF COUNTRIES
Africa	49
Latin America	29
Asia (excluding Japan and Israel)	32
Fiji	1
Papua-New Guinea	1
	TOTAL = 112

In the area of mortality, Keyfitz and Cummings (see Keyfitz, 1968), Brass (1968), Carrier and Hobcroft (1971), Kurup (1965) and Ledermann (1969) have also produced different types of model life tables. Model fertility tables have been generated by Bogue and Palmore (1964), Bourgeois-Pichat (1965) and Mitra (1966). Model nuptiality tables have been developed by Coale (1971) and Roberts and Krishnan (1973). Model tables for divorce have been suggested by Krishnan and Kayani (1976), and for migration by Rogers (1978).

2.3.1 Rationale

The basic rationale behind the methodology is that, if the correlation between one indicator and another is high, one of them can be used as a satisfactory predictor for the other. If one of them is guessed, or estimated at low cost, then the other will be known by the prediction process. The crude activity rates are easily obtained through surveys, but age-specific data may not always be available in many countries, especially the developing ones. Therefore, the model tables are directed toward estimating age-specific values from crude rates. Reliable estimation is thus possible for countries with scanty or unreliable age-specific data.

The basic input data for the construction of the model working life tables are the labour force participation rates and model life table values. Thus, by knowing a country's mortality condition and crude labour force participation

rate, estimates of working life expectancy at various age groups are obtained through simple interpolation from the model values (as provided in Appendices B and C).

2.3.2 Regression Technique

The regression technique is utilized here to predict age-specific rates from crude indicators. The dependent variable entered into the first regression analysis is the age-specific labour force participation rate (ASLFPR) for those under the age of 15. The dependent variable used in the second equation is the ASLFPR for the age group 15-19 ... and so forth. Independent variables entering into each of the seven regressions are the ASLFPRs for the remaining age groups. For example, the LFPR of the age group under 15 is used to regress on the ASLFPRs for the remaining age groups 15 to 65+ plus the crude participation rate (CPR). The process is as follows:

$$ASLFPR \ (X1) = A + B2(X2) + B3(X3) + \ldots + B7(X7) + B8(CPR)$$

$$ASLFPR \ (X2) = A + B3 \ (X3) + \ldots + B7 \ (X7) + B8 \ (CPR)$$

$$ASLFPR \ (X3) = A + B4 \ (X4) + \ldots + B7 \ (X7) + B8 \ (CPR)$$

$$ASLFPR \ (X4) = A + B5 \ (X5) + \ldots + B7 \ (X7) + B8 \ (CPR)$$

$$ASLFPR \ (X5) = A + B6 \ (X6) + B7 \ (X7) + B8 \ (CPR)$$

$$ASLFPR \ (X6) = A + B7 \ (X7) + B8 \ (CPR)$$

$$ASLFPR \ (X7) = A + B8 \ (CPR)$$

Note that all the regression equations include the independent variable CPR. Since the others do not add much to the prediction efficiency, we can ignore them. Thus, in this study, the age-specific rate is simply treated as a linear function of the CPR.

Unfortunately, much useful information is unavailable due to some of the broad age-groupings employed in the data from the Year Book. For instance, the most significant age-specific data are combined into a very broad group (e.g. 25 - 44 years). Thus we have the CPRs for males and females, plus age-specific rates for the age groups under 15 (taken as 10-14 years), 15-19, 20-24, 25-44, 45-54, 55-64, and 65+.

2.3.3 Transformation

Regression analysis assumes that the underlying relationship between Y and X_i ($i = 1, 2, \ldots k$) is linear and that the combined effects of independent variables are additive (Kim & Kohout, 1975:368). Thus, for a multivariate case, the underlying relationship between Y and X_i ($i = 1, 2, \ldots k$) is assumed to take the form:

$$Y = A + B_1 (X_1) + B_2 (X_2) + \ldots + B_k (X_k)$$

However, there are many occasions in which simple linear models are inadequate. A preliminary study was done to see

the type of results that may ensue from the data (Chow, Lalu & Krishnan, 1981). In the developed countries, the correlations for males, between the age-specific labour force participation rate (ASLFPR) and crude participation rate (CPR) were found to be very low. For the females, the correlation between ASLFPR and CPR for those aged 19 years and under was also low. Therefore, log transformation and curvilinear regression techniques etc., were called upon to improve the correlations between the ASLFPR and the CPR for these age groups. The equations employed for these transformations are shown as follows:

$$Ln(ASLFPR) = A + B \ (CPR)$$
$$Ln(ASLFPR) = A + B \ Ln(CPR)$$
$$SQRT(ASLFPR) = A + B \ (CPR)$$
$$ASLFPR = A + B/X + C/X^2$$
$$Ln(ASLFPR) = A + B + CX^2$$

The results of these transformations are discussed fully in Chapter 4.

The high correlation coefficients (obtained for males and females in developing countries and also for females above 20 years of age in developed countries) are employed to develop a set of model tables of age-specific participation rates for a given set of crude rates. This system of model tables is built under the assumption that the correlation pattern existing between the age-specific

rates and the crude rate remains unchanged.

The basic inputs for working life table are the age-specific participation rates and an appropriate life table. The basic data required for the construction of this set of model tables are the worker rates (also known as labour force participation rates) which are based on the slope and intercepts obtained from the regression analysis, and lx and Lx values of the regional model life tables by Coale and Demeny (1966). Detailed discussion on the model working life tables is presented in Chapter 5.

3.   Pattern of Labour Force Participation

3.1 Structural Changes in Society

Structural changes in society and in life styles which occur in the process of economic development, exert important influences over labour force participation (LFP) The organization of production is specialized, replacing former family businesses in productive functions. Other structural changes include increasing urbanization, decreasing agricultural employment and reductions in the importance of self-employment. These changes affect the employment opportunities of numerous segments of the population, particularly teenagers, older people and women.

In the agricultural sector, the average age of male entrants is lower and the average age of male retirement higher, than in the urban sector. As mentioned by Durand (1975:104), the entry of young males into, and the withdrawal of elderly men from the labour market are gradual processes in the traditional sectors of developing countries. The boy takes a gradually increasing role in production as he matures and gains knowledge and skill through experience, while the older man's activity diminishes gradually as his importance declines. In highly developed countries, the processes of labour force entry and exit are no longer gradual. The young and the old take little or no part in productive functions.

Social and economic changes in society play crucial roles in bringing about changes in female LFP. Oppenheimer (1970) notes that industrialization seems to generate both a supply of and a demand for female labourers. As economic development progresses, new employment opportunities for women arise primarily through increased opportunities in service occupations. Such opportunities are accompanied by increases in educational attainment, reductions in fertility and in time spent in household duties. When fertility is high, women are more likely to be occupied with household work.

3.2 Age Pattern of Participation

Analysis of patterns of variation in male and female labour force participation (LFP) can yield significant insights into the effect of socio-economic factors on the levels and trends of LFP. They reflect the behaviour of the participants and their opportunities for participation in the labour force. After a detailed analysis of the age-specific data on labour force participation rate (LFPR), Durand (1975) distinguished nine age patterns for males and six for females:

Males:

1. HH: Early entry, late retirement
2. MH: Medium entry, late retirement
3. LH: Late entry, late retirement

4. HM: Early entry, medium retirement

5. MM: Medium entry, medium retirement

6. LM: late entry, medium retirement

7. HL: Early entry, early retirement

8. ML: Medium entry, early retirement

9. LL: Late entry, early retirement

"HH, MM, and LL constitute an ideal sequence in the transition from a regime of high participation by males in the labour force to one of low participation, which is presumed to be the typical experience of countries undergoing modern economic development" (Durand, 1975:26)

Females:

1. (A) Central peak, or plateau

2. (B) Late peak

3. (C1) Early peak without shoulder

4. (C2) Early peak with shoulder

5. (D1) Double peak, early peak higher

6. (D2) Double peak, late peak higher

"The early-peak pattern implies that the female labour force is composed largely of single or young married women without children, most of whom drop out of the labour force when they marry or when they become mothers. The late-peak pattern suggests that early marriage and early motherhood inhibit high participation by young women in the labour force; it is more the older married women and widows who feel free or compelled to work for income. Central peak and central plateau patterns suggest that women's LFP is less closely related to marriage and motherhood" (Durand, 1975:39-42).

The present analysis indicates that while the male age pattern is of an inverted U-type for all nations, the female pattern is not similar for the developed and the developing countries. In the developed countries, the female age pattern is bimodal in nature, while for the developing countries, both bimodal and inverted U-type patterns are found. It appears that the level of modernization and the participation of women in non-agricultural activities are responsible for changing the female labour force participation (LFP) pattern to the bimodal type.

Figures 1 and 2 provide some examples of the female age patterns in both developed and developing countries. The life cycles of female LFP take different forms in different countries. The participation rates of married women in the more developed countries are known to be relatively high in the early years of marriage, to drop in the years when they have children, and to rise again when their children have grown older. Figure 1 shows that the age pattern of the Canadian female LFP is a double peak one (with early peak higher) in both 1961 and 1971. There is a sharp rise in participation after initial entry into the labour market. The first modal value is attained in the 20-24 age group. Then, participation is found to decline in the 25-34 age group. After this, the second phase of the working life cycle is seen with gradually rising participation to another peak at ages 45 to 54.

FIGURE 1

FEMALE LABOUR FORCE PARTICIPATION RATES BY AGE
(CANADA: 1961 AND 1971)
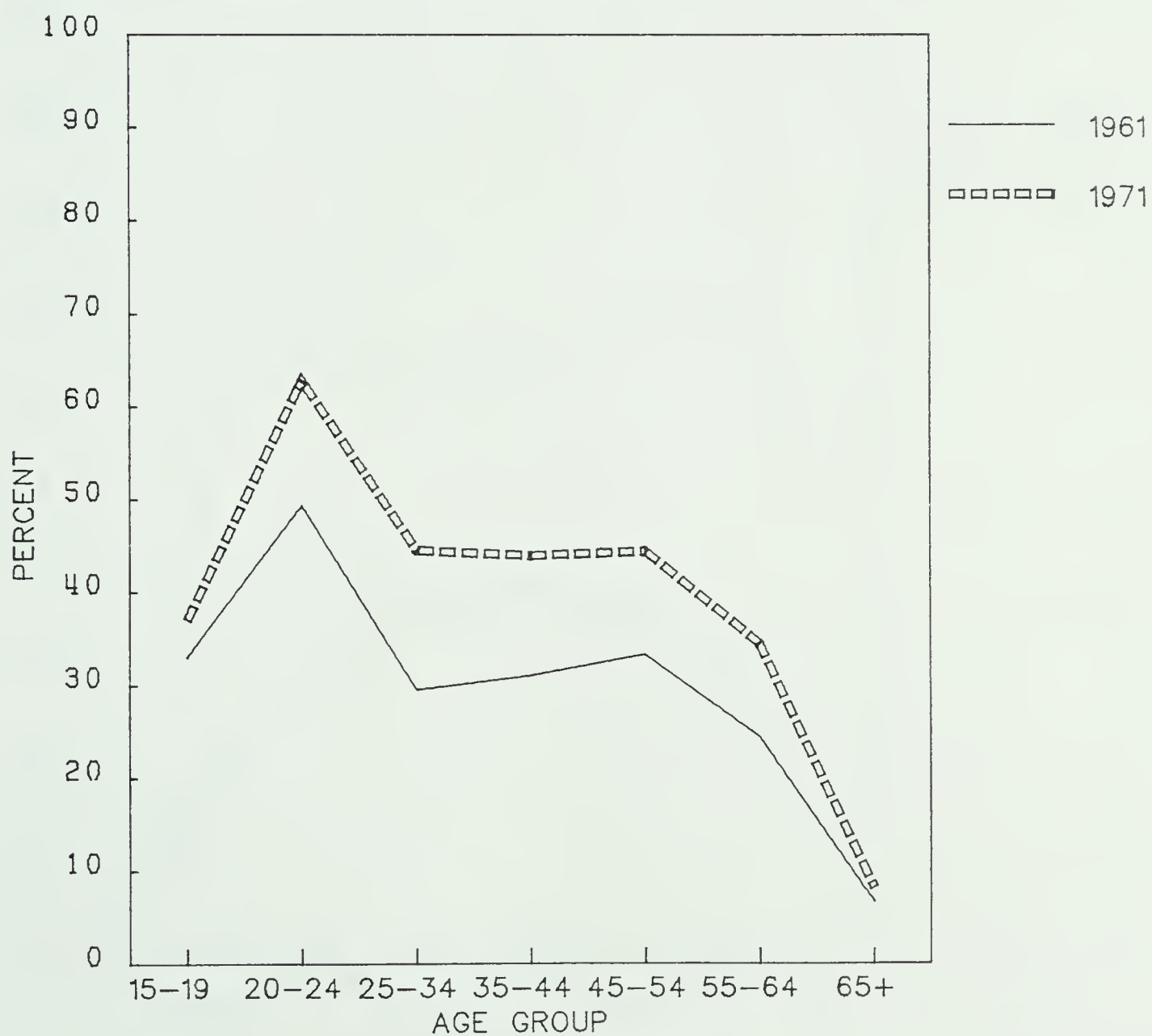
SOURCE: DATA DERIVED FROM CENSUS OF CANADA, 1961
AND 1971, STATISTICS CANADA

FIGURE 2

FEMALE LABOUR FORCE PARTICIPATION RATES BY AGE
(MOZAMBIQUE: 1970 AND IRAQ: 1977)

However, the age at which the female labour force participation rate (LFPR) hits a maximum varies from country to country. Figure 2 presents two completely different age curves of female labour force participation. The female pattern for Mozambique is double peaked (with the later peak, the highest), while for Iraq, it is a plateau pattern.

The first mode of the bimodal pattern in Mozambique occurs at ages 20-24 and the second at ages 45-54. The pattern of LFP found in the latter age group (45-54) corresponds to one of those discussed by Durand (1975) wherein there is a double peak in which the later peak is the highest. For Iraq, the female LFPRs rise to a maximum in the middle-age group (i.e., 30-44), and thereafter, the participation rate declines. More discussion on female LFP pattern is given in Sections 3.4-3.6.

3.3 Male Labour Force Participation

There are three main phases in the working life cycle of a cohort of males. These are the age of entry, the prime working ages and the age of retirement. The prime working ages include those between 25 and 54. It is here that the participation rate is at its maximum. For the older age groups, labour force participation drops off gradually to start with and declines more sharply with increasing age.

The participation rates of males in the youngest and oldest groups tend to fall as economic development

progresses. That is, the age of male labour market entrants rises and the age of retirement falls. As indicated by Durand (1975:93), while the late-retirement pattern coincides with a relatively low level of economic development, early retirement coincides with a higher level. The shortening at both ends of the male working life span is a result of economic and social changes in the processes of economic development and modernization. These tend to diminish opportunities for the young and the elderly to work for income.

In Table 2, the average age-specific participation rates for males in the developed and the developing countries are shown. The overall crude rate is 57.3 per cent (with a S.D. of 3.2) in developed countries, and 51.3 per cent (with a S.D. of 5.3) in the developing countries.

Figures 3 and 4 reveal that the pattern for males is of the inverted U-type in both developed and developing countries. Participation rates rise with age and remain fairly constant until about 55 years of age. Thereafter the rates begin to decline reaching a low of 56.2 per cent for the age group 65 and above in developing countries, compared with 26.3 per cent in developed countries. Before age 25, the participation rate increases with each successive age group as teenagers leave school and take jobs in the labour market. After age 55, the participation rate declines, at first slowly with each successive age group and then sharply at the higher age groups, particularly those after age 65.

TABLE 2

AVERAGE LABOUR FORCE PARTICIPATION RATES, MALES
(MID-YEAR 1975)

AGE GROUP	DEVELOPED COUNTRIES		DEVELOPING COUNTRIES	
	RATE	STD DEV	RATE	STD DEV
Under 15	0.9	1.5	5.7	3.9
15 - 19	48.9	11.1	62.7	14.5
20 - 24	84.6	4.6	89.2	5.0
25 - 44	96.8	1.1	97.0	1.3
45 - 54	94.3	2.0	95.4	2.3
55 - 64	77.7	10.1	86.3	7.3
65 and above	26.3	15.3	56.2	16.7
All	57.3	3.2	51.3	5.3

Source: Regression Analysis

TABLE 3

AVERAGE LABOUR FORCE PARTICIPATION RATES, FEMALES
(MID-YEAR 1975)

AGE GROUP	DEVELOPED COUNTRIES		DEVELOPING COUNTRIES	
	RATE	STD DEV	RATE	STD DEV
Under 15	0.7	1.2	3.3	3.3
15 - 19	42.7	9.9	31.9	21.6
20 - 24	61.4	11.1	40.7	23.4
25 - 44	49.8	20.3	39.7	25.2
45 - 54	48.5	19.6	38.9	25.4
55 - 64	30.9	12.8	30.5	21.5
65 and above	8.5	7.4	15.5	14.3
All	30.9	9.8	22.3	14.3

Source: Regression Analysis
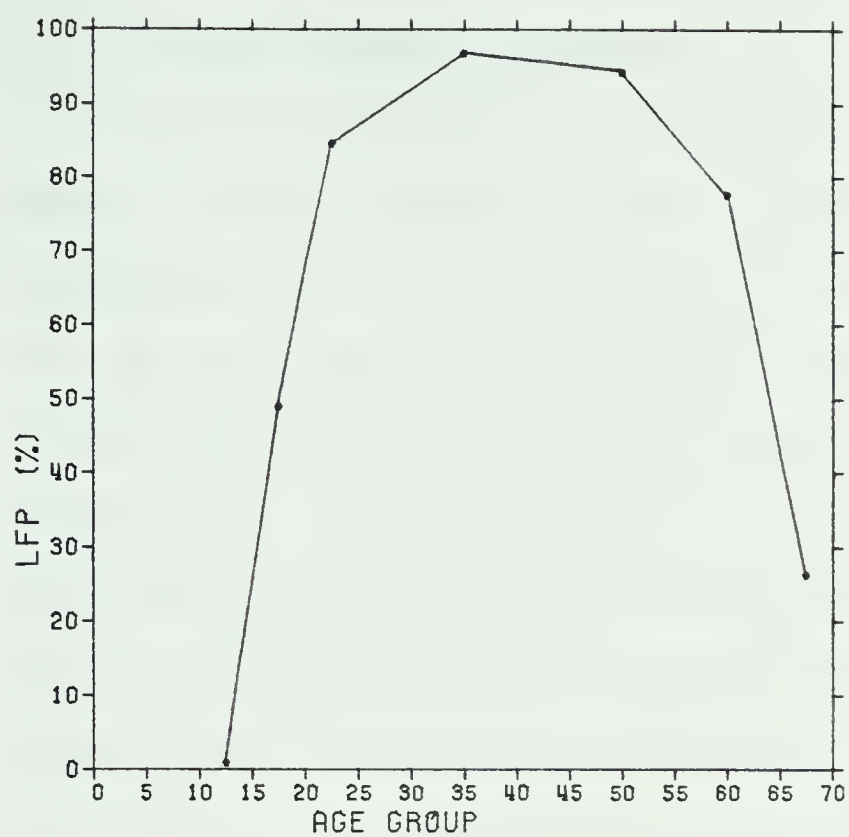
FIGURE 3:
AVERAGE MALE LABOUR
FORCE PARTICIPATION
RATES BY AGE:
DEVELOPED COUNTRIES
(MID-YEAR 1975)
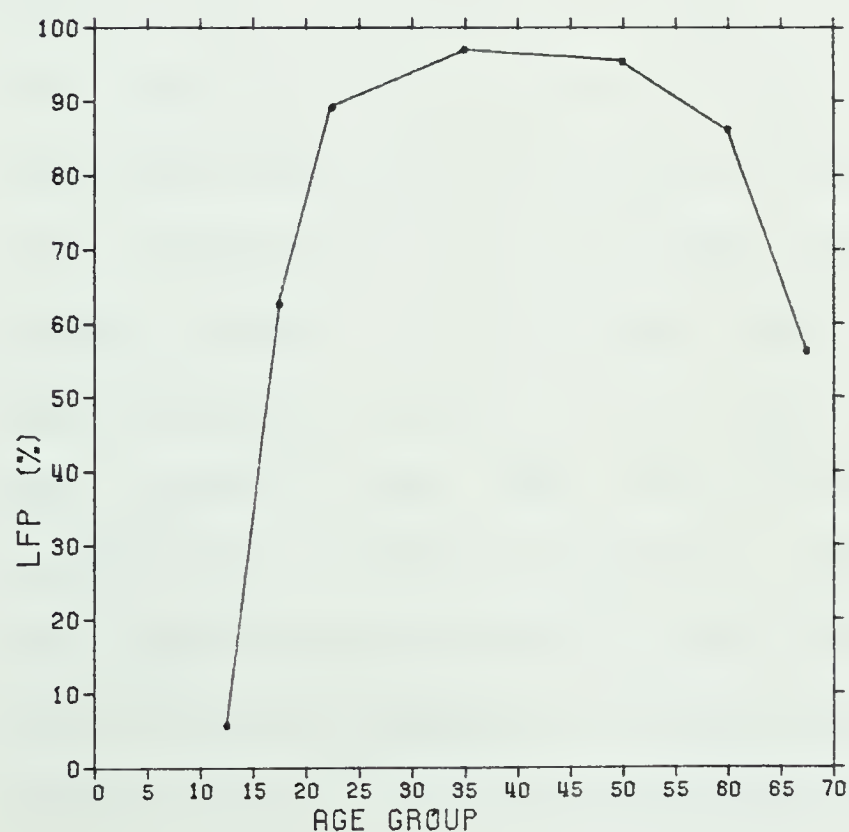
FIGURE 4:
AVERAGE MALE LABOUR
FORCE PARTICIPATION
RATES BY AGE:
DEVELOPING COUNTRIES
(MID-YEAR 1975)

3.3.1 Labour Market Entrants

A wide difference in the participation rates for the under 15 age group is noticed between the developing and developed countries. Census data on children under the age of 15 in the labour force cannot be obtained for every country, but certainly a very small proportion of children (less than one per cent) at this age are employed in developed countries, while many children of the same age take active part in economic production in the developing countries. The participation rate of the age group 15-19 is also low in the developed countries. Males in the developed countries can be regarded as entering rather "late" into the labour force. Clearly, entry into the labour force in developing countries is earlier as indicated by the higher participation rate of this age group.

The relationship between labour force participation and educational advancement has been found to be an inverse one. The lower participation rate of the younger age group in developed countries is primarily due to prolonged schooling. The delayed entry of young males (aged 15 to 19) into the labour force in developed nations is represented by an participation rate of 48.9 per cent, which is approximately one third less than that evident in the developing countries. In these countries, the average participation for boys of the same age is 62.7 per cent. In the developed countries, prolongation of schooling is considered to be an effective tool for keeping younger people out of the labour

force.   Most developing countries cannot afford to provide similar training for their young people because of the high cost involved in providing facilities for large numbers of children.

Schooling is essential to the modern economy which relies on highly specialized skills.   Hence,   greater investments in education are made by the more developed countries in order to meet the growing demand for better knowledge and skills in an industrial economy. It gives a strong incentive for young people to achieve higher education in order to cope with the labour market situation and to obtain better-paid employment.

3.3.2 Prime-age workers

While there are sharp differences in the male labour force participation rates at the upper and lower ends of the life cyle, males in the prime age groups show a typical pattern in both developing and developed countries.   The participation of the prime age workers (aged 25-54) shows little variation (95.4 per cent to 97.0 per cent in developing countries and 94.3 per cent to 96.8 per cent in developed countries)(See Table 2).   The average LFPR for males aged 25-54 has been recorded as being about 95 per cent in both types of countries. Thus, almost every man of middle   adult   age   participates   in   the   work force. "Production of income is a primary function of men in the

central adult ages, and there is no evidence of economic development having brought an important change in this respect in any society" (Durand, 1975:148).

3.3.3 Retirement Population

At the upper end of the life cycle, a difference is noticed between industrialized and non-industrialized countries. For men aged 65 years and above, the differences in labour force participation rates (LFPRs) between developed and developing countries are more pronounced than for any other age group above 15 years. On the average, about 56.2 per cent of the males over 65 in the developing countries are reported as at work, while in the developed countries the figure is only 26.3 per cent. The lower participation rate of the older age groups in developed countries is probably due to mandatory and early retirement policies.

Increases in the frequency of earlier retirement, (ie., before age 65), is indicated by a smaller difference in the average LFPR for the 55 to 64 age group (86.3 vs 77.7 per 100). Although older men may be in better health than in the past, they encounter greater competition of younger workers in the labour market. There are two important factors leading to the earlier retirement of males in developed countries: the declining importance of self-employment and retirement policies. "Not only do urban

industries have fewer employment opportunities to offer to older persons, but the higher rate of saving and the social security schemes existing in many industrialized countries also act as a stimulus to earlier retirement" (U.N., 1962:13). The high proportion working after this retirement age in developing countries is closely related to the agricultural type of work that is performed. For example, in small-scale farming, many jobs are still performed by older workers.

3.4 Female Labour Force Participation

In contrast with men, who are expected and socialized to work throughout most of their adult lives, the majority of women are not socialized for the work role in the adult life. The female working life is often interrupted, for women may enter and leave the labour force several times due to maternal responsiblities and other alternatives. As pointed out by Ostry (1968:1), "most women, unlike most men, are free to choose among many different types of activity: paid employment, leisure, volunteer work, work in the home." The pattern of female labour force participation (LFP) may change in the process of economic development and with changes in the life cycle and employment opportunities for women according to age, marital status, and family composition.

3.5 Growth of the Female Labour Force

Rapid increases in the number and proportion of women in the labour force during industrialization and modernization is due to a combination of demographic, economic, and social factors. Some of the contributing factors include: changes in the occupational structure and in employment opportunities, increases in educational attainment, rising urbanization, reductions in family size and household duties, desires to maintain family living standards, as well as the changing family and kinship systems.

3.5.1 Changing Occupational Structure and Job Opportunities

Expanding employment opportunities play a crucial role in increasing female labour force participation. Structural changes in the economy during industrialization create a favorable demand for female workers. The job opportunities for women have expanded, especially in the white-collar, sales and services sectors of the economy. These expansions enable middle-aged married women in developed countries to re-enter the labour force after their childbearing and childcaring period.

3.5.2 Increases in Educational Attainment

Increases in educational and vocational training for females, along with a country's modernization, create better opportunities for women to be employed in the labour force.

"The more educated the woman, the greater the employment opportunities, and the greater the pull or attractiveness of the labour market" (Kalbach & McVey, 1979:279). In addition, as noted by Ostry (1970:144-5), "secular improvements in education have not only made female labor more marketable but probably affected women's preferences in the allocation of their time in favor of work outside the home."

Employment opportunities for women are also affected by the changing employment considerations for men. In many highly developed countries, better educated women have been found to be suitable for many jobs previously dominated by men, and can be employed at lower wages in comparable work categories. Thus, to many employers, women are considered to be a source of inexpensive quality labour.

3.5.3 Rise in Urbanization

Demographic development, like rural-urban shifts of population, also favors the growth of female labour force activity. The transformation of a country from a rural agrarian to an urban industrialized society bears important socio-economic implications in stimulating labour force participation among women. "The expansion in female job opportunities has been largely an urban phenomenon, and urban social attitudes have been far more conducive to married women working than have rural attitudes" (Ostry, 1970:145).

3.5.4 Reduced Family Size and Household Duties

Changing marital and fertility patterns in the advanced stage of economic development have exerted a significant influence upon female work force participation. The recent decline in average family size in highly developed countries reflects the reduction in the childcaring burden. Earlier age at marriage and smaller family size have contributed to the compression of the childbearing stage in the life cycle. The consequence of this compression is that the age of re-entry into the labour force is younger, thus expanding the working stage of the female life cycle.

Changes on the supply side of female labour force also play an important role in producing rapid growth of female workers. Females generally have greater domestic responsibilities and these compete with outside employment. However, as economic development progresses, this conflict is reduced by factors such as: the mechanization of household work, commercial substitutes for domestic products, and reduction in weekly work hours and increasing part-time employment.

3.5.5 Maintaining Family Living Standards

Besides seeking alternative roles in society, the need for additional income to meet family needs in highly developed societies is one of the major reasons for married women to enter (or re-enter) into the labour market. "The increasing participation of females in the labour force has

demonstrated that there are more options or alternatives available to the Canadian woman than just the traditional roles of wife and mother. Coupled with economic strains of inflationary times, for many families and married couples it has become a necessity for both partners to be employed" (McVey, 1981).

In addition to the above considerations however, the organization of the family and kinship system is also a crucial factor for understanding the trend of female labour force participation.

3.5.6 Changing Family and Kinship systems

The stability of the family and kinship system is one of the determinants of female labour force participation. Industrialization influences the incidence of divorce and marital instability forcing women to ensure their economic security through labour force activity. Collver & Langlois (1962:367-385) point out that in countries where the family and kinship systems are stable and therefore able to maintain social control and provide support for members, females have less need to work outside of their homes. But in countries where the family system is not as stable, where more individuals remain single or do not stay married, and where they cannot fall back on kin for support, females are forced to join the labour market and become self-sufficient.

3.6 Findings

Table 3 reveals that women of ages 20-24 demonstrate the maximum labour force participation (LFP), with a peak participation rate of 61.4 per cent in developed nations and 40.7 per cent in developing countries. Thereafter, participation rates tend to decline with increasing age. In the developing countries, participation rates show very little variation from the early 20s to about the age of 50. This is because much of production is carried out in household enterprises, and changes in a woman's marital status or in family composition do not have the same implications as they do in the industrialized countries.

From Table 3, we see that the overall crude rate for women in the less developed countries is lower (22.3% vs 30.9%). Entry into the labour force is earlier and exit later. The age pattern is of the inverted U-shape type. Although higher female LFP at the youngest and oldest ages, a pattern similar to that for males, is found in developing countries, much higher overall participation of women aged 15 to 54 is found in the industrialized countries. Values in Table 3 indicate that in the developed countries, large numbers of women join the labour force in their late teens and continue working until their mid-twenties. Thereafter, their work participation declines.

A sharp decline in participation rates is observed after age 25, and thereafter the decline is more gradual until age 55. To a lesser extent, this also holds true for

the developing nations, and reflects the tendency for women with small children under their care, to be less likely to accept paid employment. After age 55, again, the labour force participation rate (LFPR) falls off sharply, and after age 65, very few women continue to work in the more developed nations.

In Figures 5 and 6, the age patterns of female LFP in both developed and developing regions are presented. The age curves for female LFPR take diverse forms, and therefore cannot be interpreted easily. Some women enter and leave the labour market several times during their life cycles. In more developed countries, the double-peaked pattern has evolved for married women due to smaller family size and the concentration of child-bearing in the early years of marriage. These conditions are favorable to the increased participation rates of middle-aged women. As Ostry (1968:17) suggests: "while marital status is clearly an important determinant of the LFP of women, marriage itself is, in fact, a lesser inhibitor of their LFP than the presence of children in the home".

In view of the broad age groupings used in the data generation, the bimodality of the distribution known to exist in developed countries is not revealed here. Instead a pattern of early peak is indicated (Figure 5).
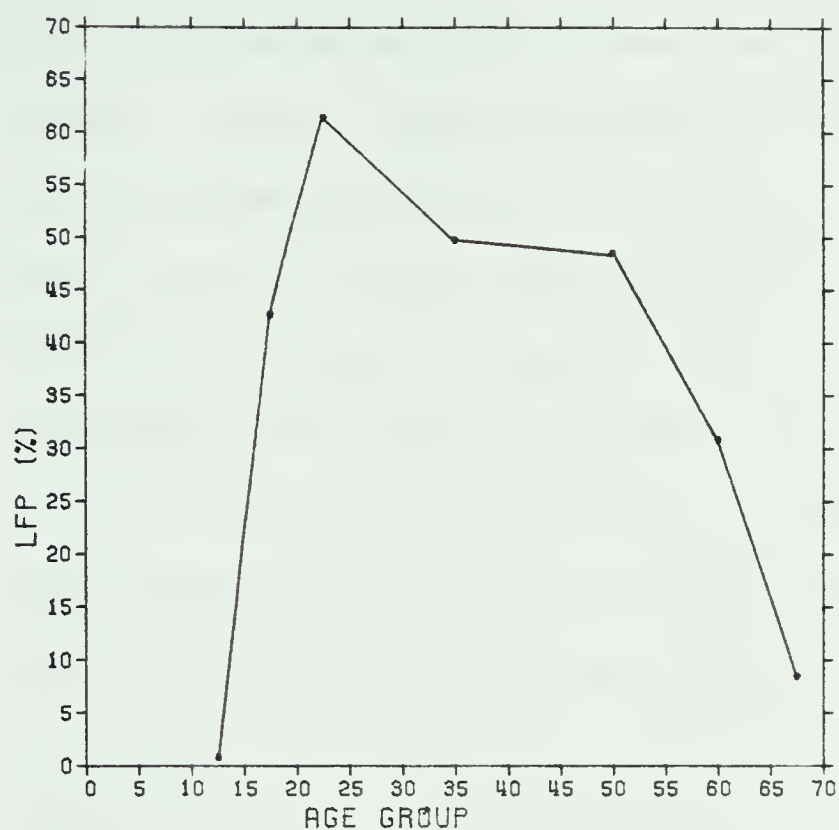
FIGURE 5:
AVERAGE FEMALE
LABOUR FORCE
PARTICIPATION RATES
BY AGE:
DEVELOPED COUNTRIES
(MID-YEAR 1975)
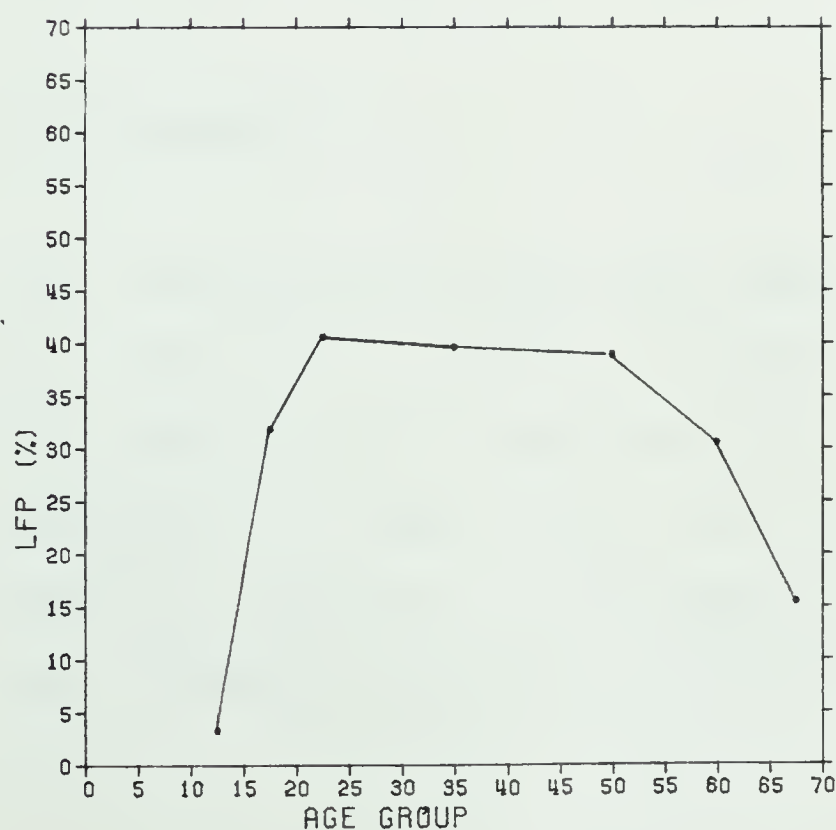
FIGURE 6:
AVERAGE FEMALE
LABOUR FORCE
PARTICIPATION RATES
BY AGE:
DEVELOPING COUNTRIES
(MID-YEAR 1975)

The early-peak pattern, one may note, implies that the female labour force is comprised largely of single or newly married women without children, and many of them will drop out of the labour force when they marry or when they have children. Some of these dropouts reenter the labour force when their children have grown older.

A central plateau pattern of female LFP is shown in developing countries (Figure 6). This suggests that women's participation in the labour force is not closely related to marriage and motherhood. As noted by Durand (1975:133), the central peak or plateau and late peak patterns are found mainly in less developed countries, where most of the women in the labour force are unpaid family workers or are employed at home in handicraft industries, retail trade "in the front room," and other such activities that combine easily with the roles of the housewife and mother.

3.7 Discussion

3.7.1 Participation Rates And Population Structure

The size of a country's labour force in proportion to its population is determined by levels of male and female age-specific labour force participation (LFP) and the age-sex structure of the population. Decreasing male LFP can influence the trend of female LFP positively.

The dynamics of the age structure of a population have some effects on age-specific labour force participation rates. The proportion of adults to children in a population structure partly determines the size of a country's labour force; and changes in the age structure of a population depends largely on the level of fertility in a country. "A high proportion of younger children, due to a high birth rate, may tend to depress activity rates of women by adding to their responsibilities as mothers; conversely, high activity rates of women in child-bearing age groups may depress fertility; migration may affect specific activity rates; and so forth" (U.N., 1968:43).

Countries with an age structure showing the pattern of early employment are in a disadvantaged position. A high proportion of children in the population may contribute to a high LFPR in the school-going age group, since the greater the number of children, the harder it is for a country to keep them all in school. "In these countries, large proportions of people are in the young age groups, a fairly small increase of the percentage employed between ages 10 and 14 produces a large increase in actual number employed. By the same argument, variation in percentages economically active at higher ages has rather little effect in the total number of people working" (Barclay, 1958:270).

The adult population is younger in developing countries than in developed countries due to the different levels of fertility. High levels of fertility as are evident in

developing countries, produces relatively large proportions

of an adult population consisting of late teenagers having

lower participation rates than those in the middle-age

population.   Alternatively, in developed countries, there

are relatively fewer children, and larger numbers of older

people.

4. Model Tables of Labour Force Participation

4.1 Rationale

It has been revealed in the previous chapter that the curves for male labour force participation (LFP) in both developing and developed countries take the inverted-U shape. Under a simple assumption that men remain in labour force once they have entered it, two consecutive age-specific rates are expected to be highly correlated. Hence, the labour force participation rate (LFPR) of an age group can best be predicted by the crude rate or by the LFPR of the sucessive age group. Thus, it is possible to use the crude rate as a good predictor of the age-specific LFPR.

4.2 Correlation Patterns among Age-Specific Rates

4.2.1 Developed Countries

The intercorrelations among the age-specific rates themselves and their correlation with the crude rates for both sexes have been developed and are shown in Tables 4 and 5. For males, the correlations between the age-specific participation rates and the crude rate are very low. Therefore, prediction of age-specific values with the crude rate is bound to have a high degree of error. The intercorrelations of the specific rates among themselves are also low. The highest correlation was found between the

rates for 20-24 and 25-44 age groups (r=0.6947). Several attempts at data transformation have been made to improve the correlations and to achieve better prediction. The results of these data transformations are presented later.

For females, the situation is a bit better. The crude participation rate (CPR) is highly correlated with the age-specific rates for the groups aged 20-24, 25-44, 45-54, 55-64, and moderately with the rate for the 65+ age group. Except for the age group below 20 years, the crude rate is the best predictor of age-specific LFPRs for all age groups. The correlation between the specific rate for the age group below 20 and the crude rate is indeed low. Those highly correlated with the crude rate are intercorrelated among themselves. Thus, it is possible to predict the specific rates for the age groups 20 and above, if the crude rate is known. For the under 20 age groups, some transformations have also been attempted for improved prediction.

The intercorrelations among the age-specific rates for females are very high, especially for the age groups 20-24, 25-44, 45-54 and 55-64 (Table 5). The highest correlation coefficient (r=.9625) is seen between the participation rates for the age groups 25-44 and 45-54. Hence, prediction of the age-specific rates for the age groups above 20 can be achieved by using either the crude rate or the rate of the adjacent age group, if the latter is known or predicted satisfactorily.

TABLE 4 : PEARSON CORRELATIONS OF AGE-SPECIFIC LABOUR FORCE PARTICIPATION RATES AND CRUDE PARTICIPATION RATES: DEVELOPED COUNTRIES (MALES)

	-15	15-19	20-24	25-44	45-54	55-64	65+	CPR
-15	1.00000	0.47853	0.21788	0.01017	-0.10234	0.08119	0.53429	-0.11396
15-19	0.47853	1.00000	0.49375	0.30861	0.24872	0.19185	0.19834	0.15563
20-24	0.21788	0.49375	1.00000	0.69469	0.42337	0.01976	0.20323	0.10761
25-44	0.01017	0.30861	0.69469	1.00000	0.66490	0.01465	0.18448	0.30874
45-54	-0.10234	0.24872	0.42337	0.66490	1.00000	0.59085	0.38398	0.37767
55-64	0.08119	0.19185	0.01976	0.01465	0.59085	1.00000	0.54905	0.24048
65+	0.53429	0.19834	0.20323	0.18448	0.38398	0.54905	1.00000	0.21608
CPR	-0.11396	0.15563	0.10761	0.30874	0.37767	0.24048	0.21608	1.00000

TABLE 5 : PEARSON CORRELATIONS OF AGE-SPECIFIC LABOUR FORCE PARTICIPATION RATES AND CRUDE PARTICIPATION RATES: DEVELOPED COUNTRIES (FEMALES)

	-15	15-19	20-24	25-44	45-54	55-64	65+	CPR
-15	1.00000	0.11986	-0.21368	-0.07268	-0.15606	0.06186	0.44659	-0.10992
15-19	0.11986	1.00000	0.19981	-0.02370	-0.03286	-0.02751	-0.03827	0.02323
20-24	-0.21368	0.19981	1.00000	0.83177	0.80268	0.52629	0.27596	0.85388
25-44	-0.07268	-0.02370	0.83177	1.00000	0.96250	0.62830	0.35511	0.96718
45-54	-0.15606	-0.03286	0.80268	0.96250	1.00000	0.74165	0.39293	0.96568
55-64	0.06186	-0.02751	0.52629	0.62830	0.74165	1.00000	0.73628	0.74226
65+	0.44659	-0.03827	0.27596	0.35511	0.39293	0.73628	1.00000	0.47035
CPR	-0.10992	0.02323	0.85388	0.96718	0.96568	0.74226	0.47035	1.00000

TABLE 6:   PEARSON CORRELATIONS OF AGE-SPECIFIC LABOUR FORCE
           PARTICIPATION RATES AND CRUDE PARTICIPATION RATES:
           DEVELOPING COUNTRIES (MALES)

	-15	15-19	20-24	25-44	45-54	55-64	65+	CPR
-15	1.00000	0.86031	0.60026	0.52736	0.69352	0.72018	0.79314	0.72891
15-19	0.86031	1.00000	0.83510	0.62847	0.70343	0.68329	0.72385	0.77089
20-24	0.60026	0.83510	1.00000	0.67112	0.58240	0.50750	0.52815	0.64941
25-44	0.52736	0.62847	0.67112	1.00000	0.81363	0.54288	0.49762	0.56189
45-54	0.69352	0.70343	0.58240	0.81363	1.00000	0.83128	0.75406	0.55552
55-64	0.72018	0.68329	0.50750	0.54288	0.83128	1.00000	0.92273	0.43632
65+	0.79314	0.72385	0.52815	0.49762	0.75406	0.92273	1.00000	0.53517
CPR	0.72891	0.77089	0.64941	0.56189	0.55552	0.43632	0.53517	1.00000

TABLE 7:   PEARSON CORRELATIONS OF AGE-SPECIFIC LABOUR FORCE
           PARTICIPATION RATES AND CRUDE PARTICIPATION RATES:
           DEVELOPING COUNTRIES (FEMALES)

	-15	15-19	20-24	25-44	45-54	55-64	65+	CPR
-15	1.00000	0.89161	0.74230	0.78467	0.76571	0.73652	0.69734	0.83471
15-19	0.89161	1.00000	0.91894	0.89744	0.86556	0.79596	0.66487	0.93664
20-24	0.74230	0.91894	1.00000	0.96401	0.93577	0.87310	0.72638	0.96765
25-44	0.78467	0.89744	0.96401	1.00000	0.98581	0.93420	0.80315	0.98720
45-54	0.76571	0.86556	0.93577	0.98581	1.00000	0.96935	0.83757	0.97448
55-64	0.73652	0.79596	0.87310	0.93420	0.96935	1.00000	0.92031	0.92921
65+	0.69734	0.66487	0.72638	0.80315	0.83757	0.92031	1.00000	0.80682
CPR	0.83471	0.93664	0.96765	0.98720	0.97448	0.92921	0.80682	1.00000

4.2.2 Developing Countries

In Tables 6 and 7, the correlations of the age-specific labour force participation rates (ASLFPRs) with the crude participation rate, and intercorrelations among all the age groups for both males and females are given. The correlation coefficients are exceptionally high throughout. The age-specific rates of each age group are strongly correlated with their adjacent rates. For females, the correlation of the crude rate with the ASLFPRs is higher than the intercorrelations among the latter. Clearly, this very high correlation makes it possible for one to use the linear relationship to predict the age-specific rates from the crude rate.

4.3 Data Transformation

The low correlations between the age-specific rates and the crude rates for males, and for females under 20 in developed countries, indicate that a simple linear regression model is inadequate for prediction purposes. First, the adequacy of the linearity assumption has to be tested. An examination of the scatterplots in Figures 7A-7G and 8A-8B suggests a great deviation from linearity between the specific labour force participation rate (LFPR) and the crude rate. In fact, a very irregular pattern between the age-specific rate and the crude rate is apparent. No clear bivariate relationship can be found.

FIGURE 7A: SCATTERGRAM OF ASLFPR (UNDER 15) AND CPR - OEVELOPED COUNTRIES (MALES)
SCATTERGRAM OF (DOWN) UNOER 15   (ACROSS) CRUDE PARTICIPATION RATE
    50.81   52.24   53.67   55.10   56.53   57.96   59.39   60.82   62.25   63.68

7.50

6.75

6.00

5.25

4.50

3.75

3.00

2.25

1.50

0.75

0.0

    50.10   51.53   52.96   54.39   55.82   57.25   58.68   60.11   61.54   62.97   64.40
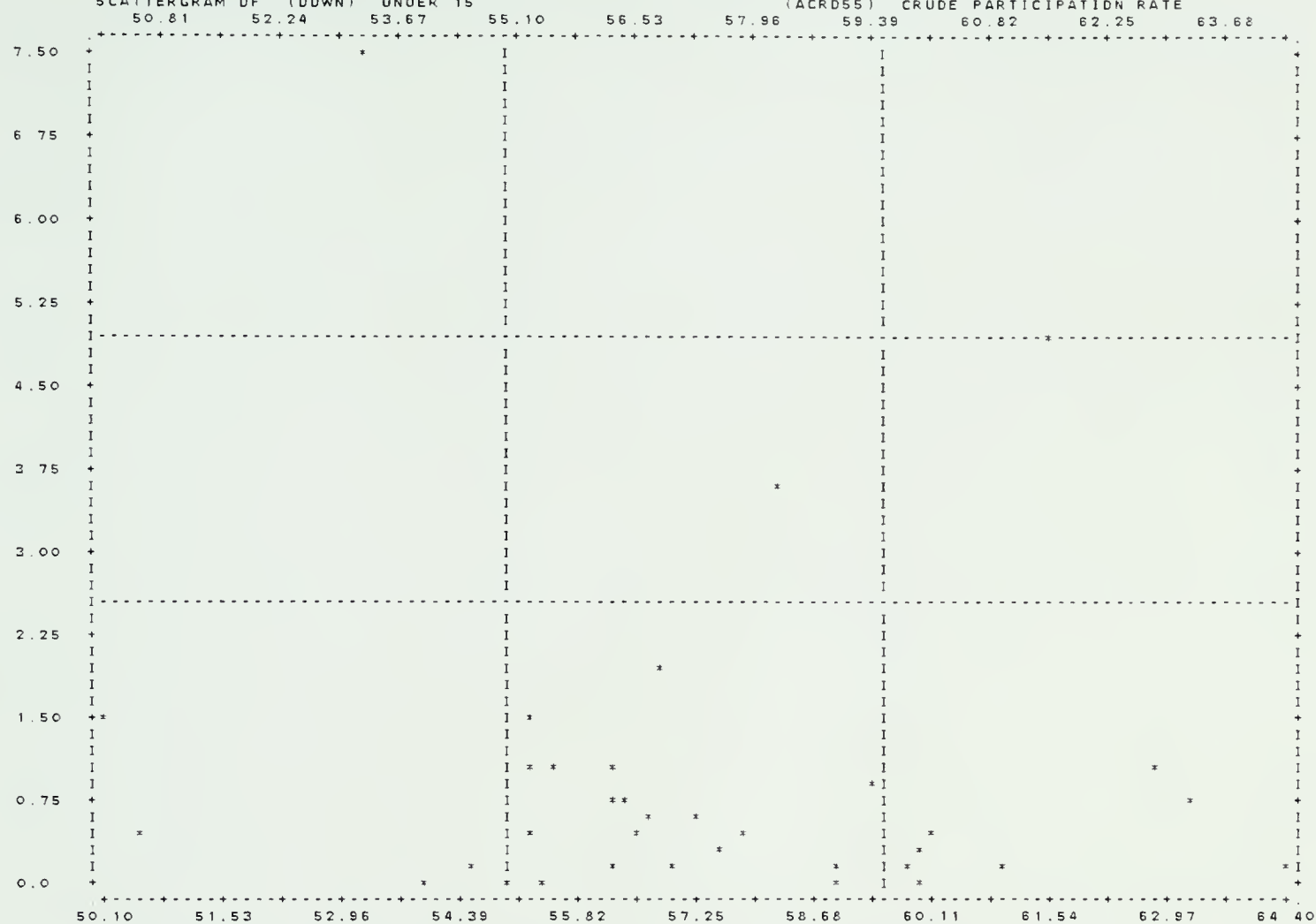
FIGURE 7B: SCATTERGRAM OF ASLFPR (15-19) ANO CPR - OEVELOPEO COUNTRIES (MALES)
SCATTERGRAM OF (ODWN) 15-19   (ACROSS) CRUDE PARTICIPATION RATE
    50.81   52.24   53.67   55.10   56.53   57.96   59.39   60.82   62.25   63.68

73.40

68.83

64.26

59.69

55.12

50.55

45.98

41.41

36.84

32.27

27.70

    50.10   51.53   52.96   54.39   55.82   57.25   58.68   60.11   61.54   62.97   64.40
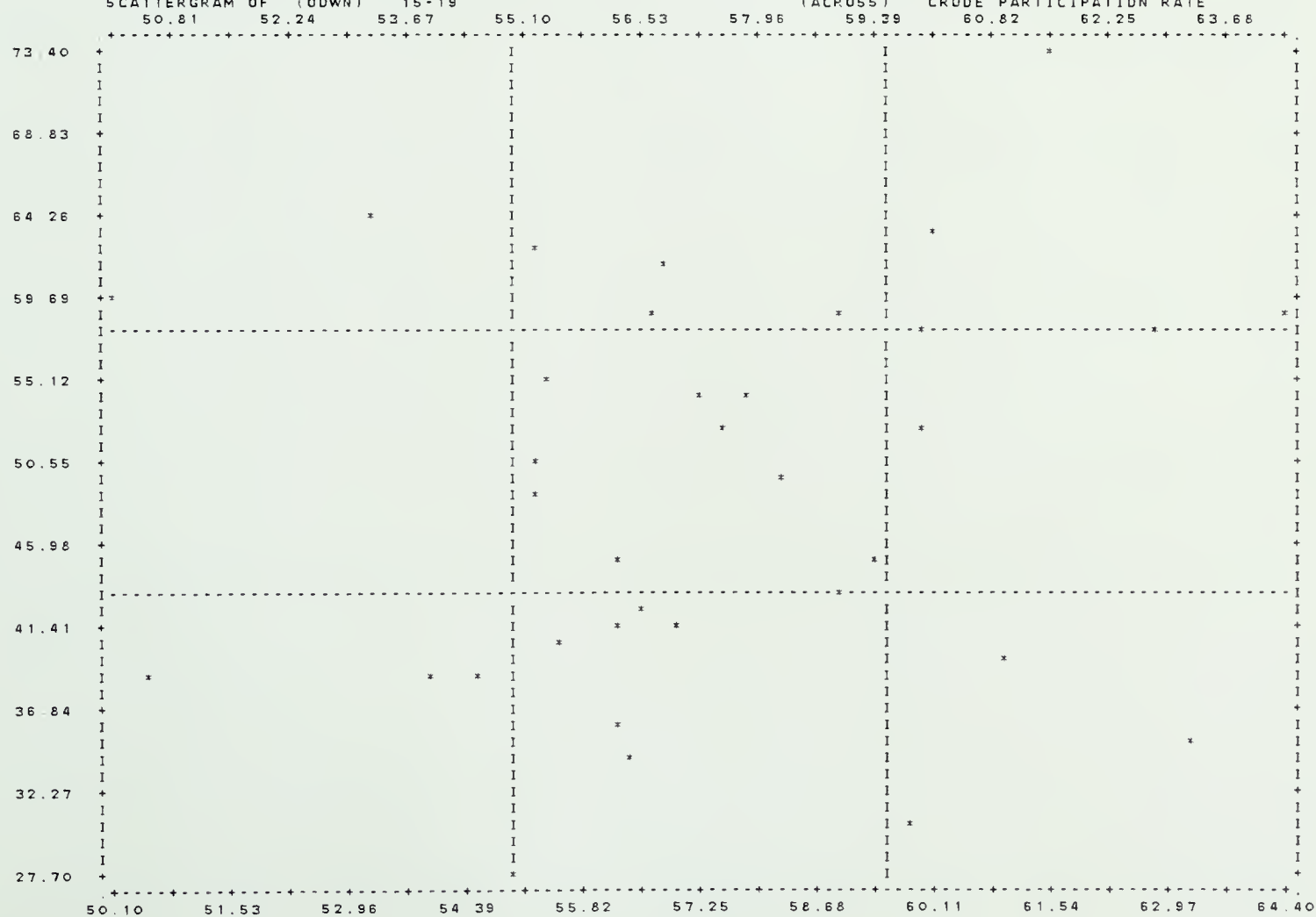
FIGURE 7C: SCATTERGRAM OF A5LFPR (20-24) AND CPR - DEVELOPED COUNTRIES (MALES)
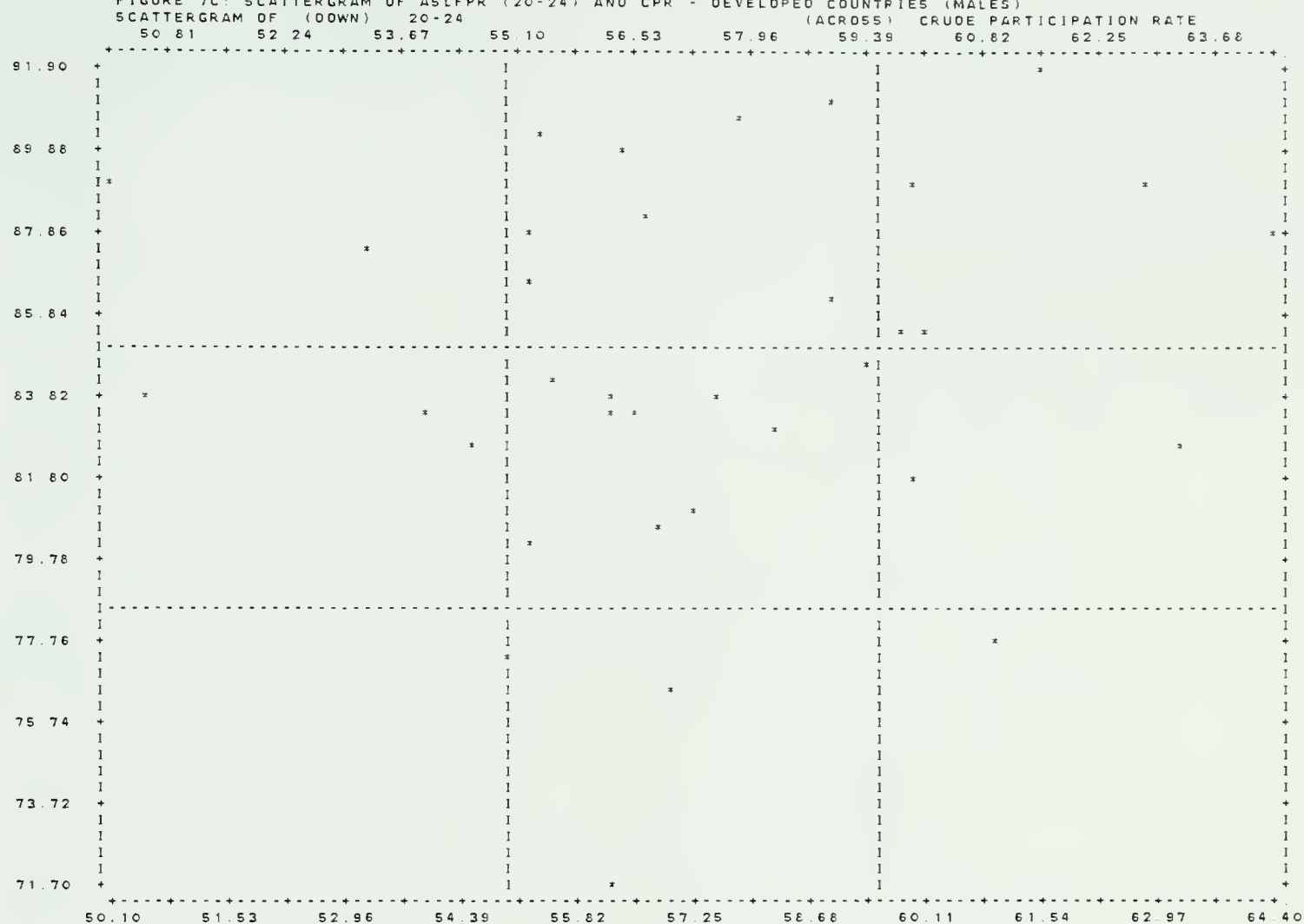
FIGURE 7D: SCATTERGRAM OF A5LFPR (25-44) AND CPR - DEVELOPED COUNTRIES (MALES)
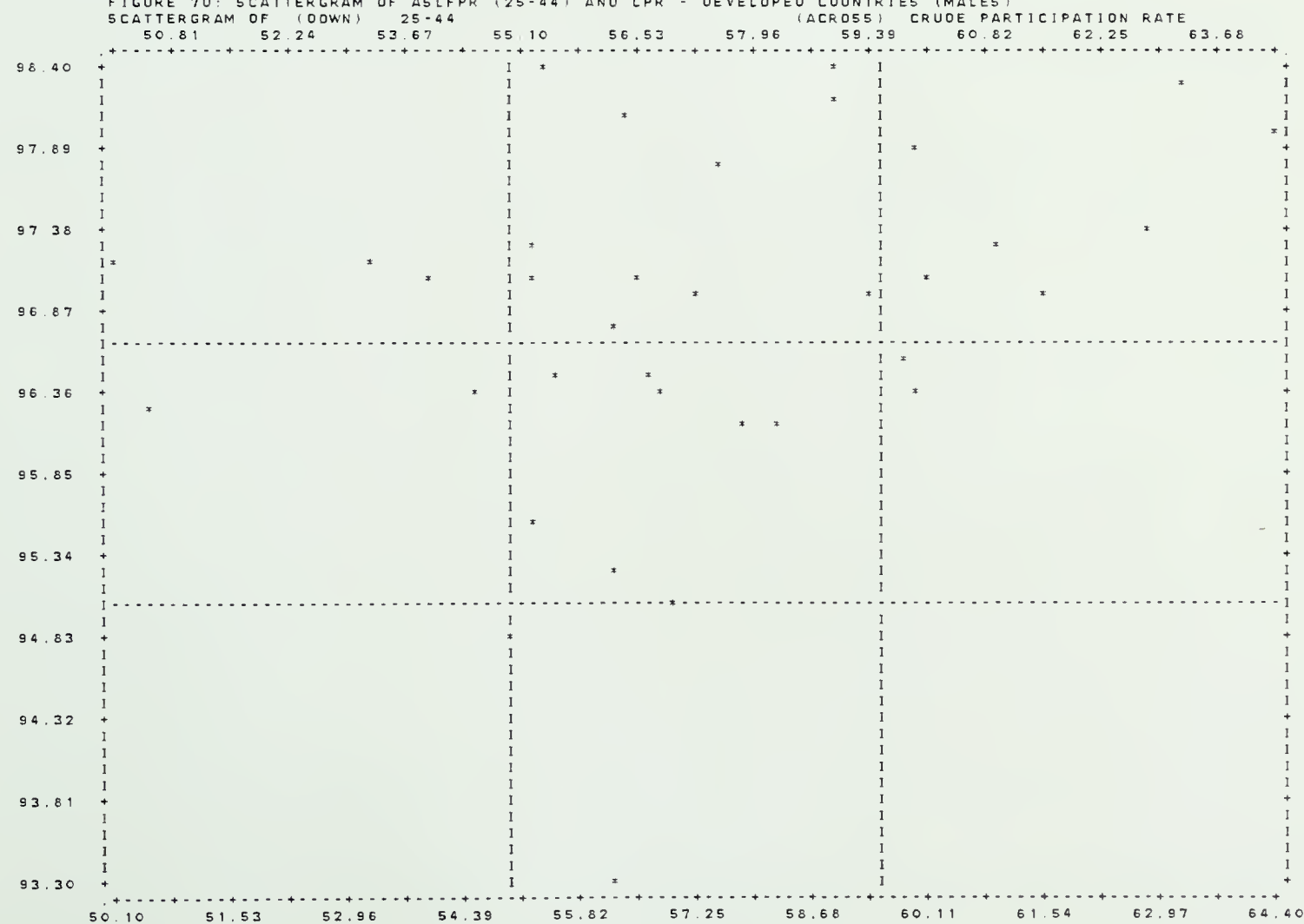
FIGURE 7E: SCATTERGRAM OF A5LFPR (45-54) AND CPR - DEVELOPED COUNTRIES (MALES)
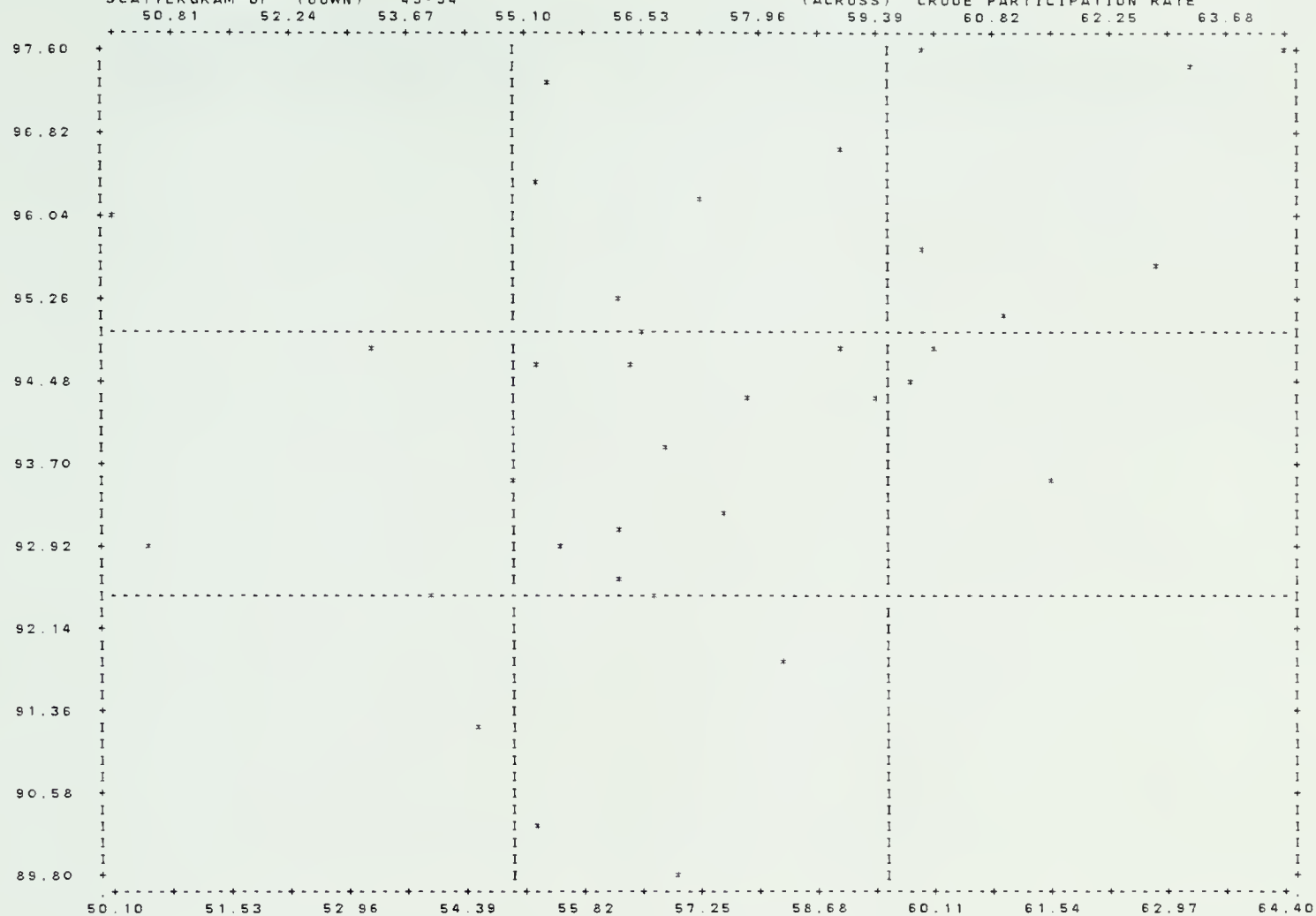
FIGURE 7F: SCATTERGRAM OF A5LFPR (55-64) AND CPR - DEVELOPED COUNTRIES (MALES)
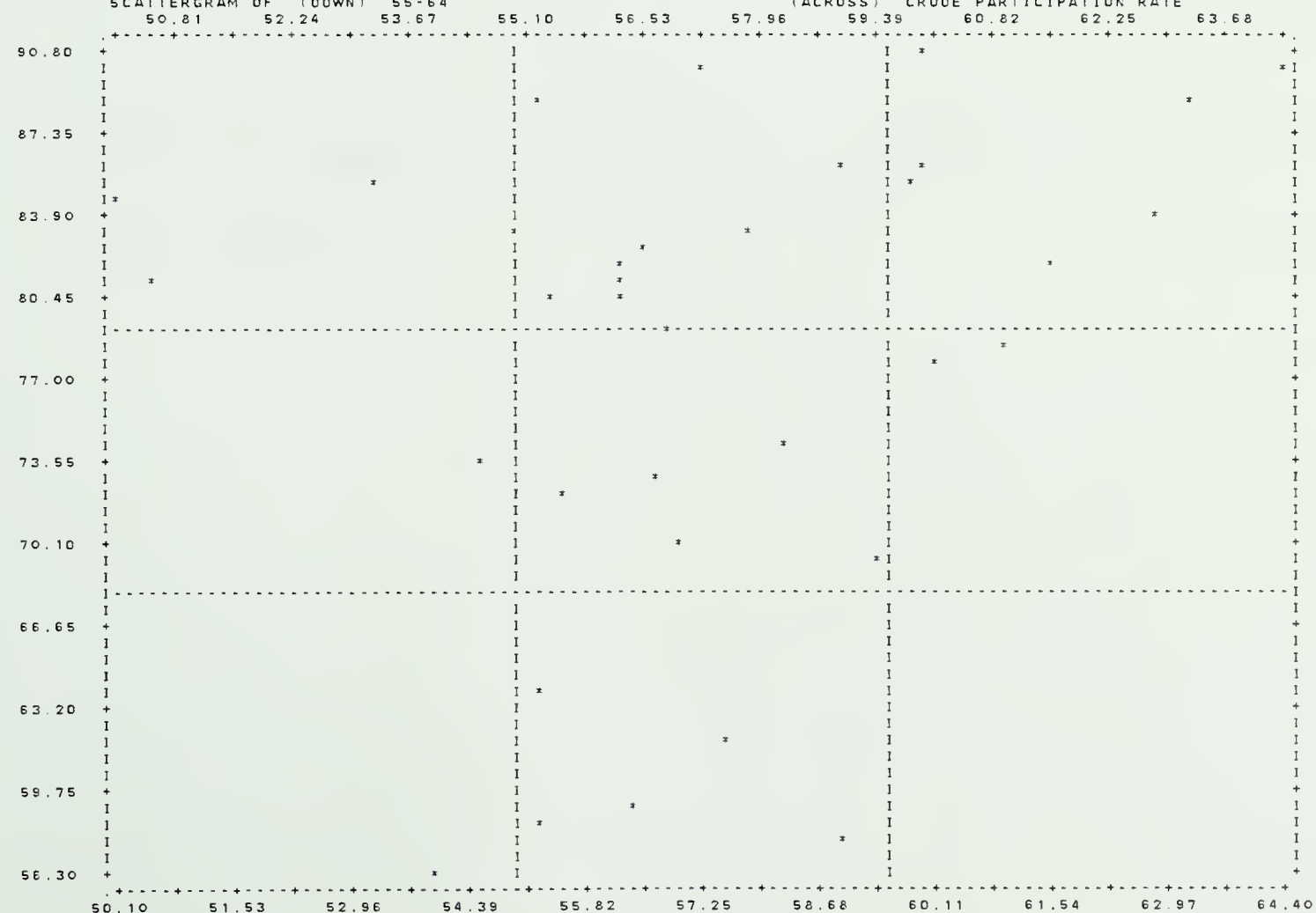
FIGURE 7G: SCATTERGRAM OF ASLFPR (65+) AND CPR - DEVELOPED COUNTRIES (MALES)

```
       SCATTERGRAM OF  (DOWN)  65 AND ABOVE                    (ACROSS)  CRUDE PARTICIPATION RATE
            50.81       52.24       53.67       55.10       56.53       57 96       59.39       60.82       62.25       63.68
          +----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+.
 67.70  +                          x           I                               I                                          +
        I                                      I                               I                                          I
        I                                      I                               I                                          I
        I                                      I                               I                                          I
        I                                      I                               I                                          I
 61.59  +                                      I                               I                                          +
        I                                      I                               I                                          I
        I                                      I                               I                                          I
        I                                      I                               I                                          I
        I                                      I                               I                                          I
 55 48  +                                      I                               I                                          +
        I                                      I                               I                                          I
        I                                      I                               I                                          I
        I                                      I                               I                                          I
        I                                      I                               I                        x                 I
 49.37  +                                      I                               I  x                                       +
        I x                                    I                               I               x             x           I
        I----------------------------------------------------------------------x--------------------------------------------I
        I                                      I                               I                                          I
        I                                      I                               I                                          I
 43.26  +                                      I                               I                                          +
        I                                      I                               I                                          I
        I                                      I                               I                                          I
        I                                      I  x           x                I                                          I
        I                                      I                               I                                          I
 37.15  +                                      I                               I                                          +
        I                                      I                               I           x                             I
        I                                      I                               I                                          I
        I                                      I                               I                                          I
        I                                      I                  x            I                                          I
 31.04  +                                      I                               I                                        x +
        I                                      I                               I                                          I
        I                                      I                               I                                          I
        I----------------------------------------------------------x------------I------------------------------------------I
        I                                      I                         x      I                                          I
 24.93  +      x                               I                               I                                          +
        I                                      x           x                   I                                          I
        I                                      I                               I  x                                       I
        I                                      I              x        x       I                                          I
        I                                      I   x         x                 I                                          I
 18.82  +                                      I                               I  x                                       +
        I                                      I            x   x              I                                          I
        I                                      I                               I                                          I
        I                                      I                               I    x                                     I
        I                                      I x        x x   x         x    I                                          I
 12.71  +                                      I    x                          I                                          +
        I                                      I                               I                                          I
        I                     x                I                  x            I                                          I
        I                                      I                               I                                          I
        I                                      I x                             I                                          I
  6.60  +                                    x I                               I                                          +
        +----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+.
          50.10       51.53       52.96       54.39       55.82       57.25       58 68       60.11       61.54       62.97      64 40
```

FIGURES 7A-7G: SCATTERGRAMS OF AGE-SPECIFIC LABOUR FORCE PARTICIPATION RATES (ASLFPRs)
         AND CRUDE PARTICIPATION RATE (CPR) - DEVELOPED COUNTRIES (MALES)

SOURCE: REGRESSION ANALYSIS

FIGURES 8A-8B: SCATTERGRAMS OF AGE-SPECIFIC LABOUR FORCE PARTICIPATION RATES
AND CRUDE PARTICIPATION RATE (CPR) - DEVELOPED COUNTRIES (FEMALES)

FIGURE 8A: SCATTERGRAM OF ASLFPR (UNDER 15) AND CPR - DEVELOPED COUNTRIES (FEMALES)

```
LFPR (UNDER 15)
        15.85      19.35      22.85      26.35      29.85      33.35      36.85      40.35      43.85      47.35
      .+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+.
 6.00 +                                  I                        *          I                                +
      I                                  I                                   I                                I
      I                                  I                                   I                                I
      I                                  I                                   I                                I
      I                                  I                                   I                                I
 5.40 +                                  I                                   I                                +
      I                                  I                                   I                                I
      I                                  I                                   I                                I
      I                                  I                                   I                                I
      I                                  I                                   I                                I
 4.80 +                                  I                                   I                                +
      I                                  I                                   I                                I
      I                                  I                                   I                                I
      I                                  I                                   I                                I
      I                                  I                                   I                                I
 4.20 +                                  I                                   I                                +
      I- - - - - - - - - - - - - - - - - I - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - I
      I                                  I                                   I                                I
      I                                  I                                   I                                I
 3.60 +                                  I                                   I                                +
      I                                  I                                   I                                I
      I                                  I  *                                I                                I
      I                                  I                                   I                                I
      I                                  I                                   I                                I
 3.00 +                                  I                                   I                                +
      I                                  I                                   I                                I
      I                                  I                                   I                                I
      I             *                    I                                   I                                I
      I                                  I                                   I                                I
 2.40 +                                  I                                   I                                +
      I                                  I                         *         I                                I
      I                                  I                                   I                                I
      I- - - - - - - - - - - - - - - - - I - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - I
 1.80 +                                  I                                   I                                +
      I                                  I                                   I                                I
      I                                  I                                   I                                I
      I                                  I                      *            I                                I
      I                                  I                                   I                                I
 1.20 +                                  I                                   I                                +
      I                                  I                                   I                                I
      I *                                I                                   I                                I
      I                                  I                    *              I                              * I
      I                                  I                                   I                                I
 0.60 +              *                   I    *                              I                                +
      I         *         *              I         *          *              I                                I
      I              *       *     *     I    *                *             I       *          *             I
      I  *               *    *    *     I                        *          I  *                   *     * I
      I                                  I                  *  *             I *                              I
 0.0  +                   *       *      I                       *           I              *       *         +
      .+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+.
       14.10      17.60      21.10      24.60      28.10      31.60      35.10      38.60      42.10      45.60      49.10
                                        CRUDE PARTICIPATION RATE
```

FIGURE 8B: SCATTERGRAM OF ASLFPR (15-19) AND CPR - DEVELOPED COUNTRIES (FEMALES)
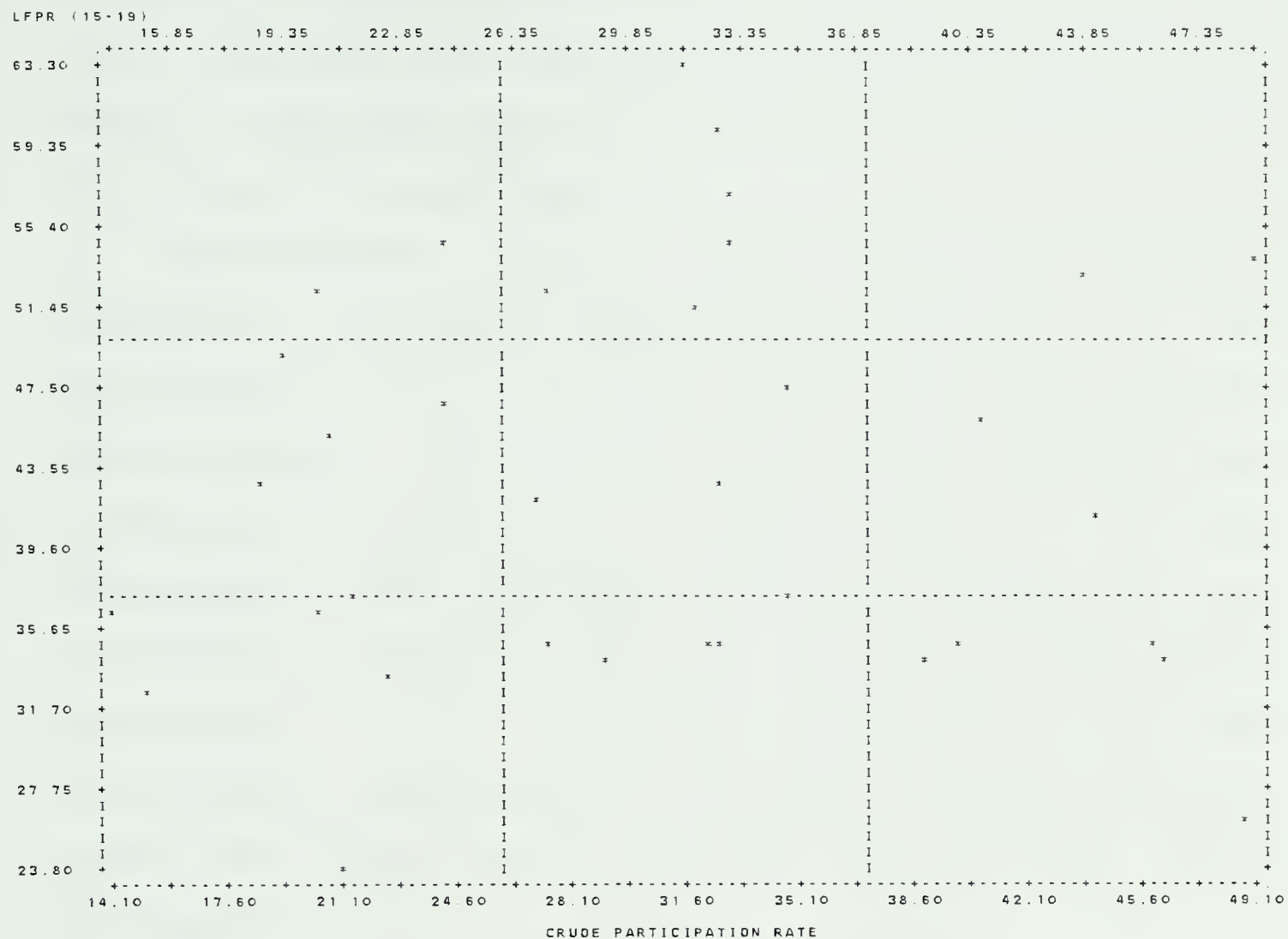
SOURCE. REGRESSION ANALYSIS

Various data transformations have been made in an attempt to handle the nonlinear situation. By doing this, it is hoped that the relationship can be restated in linear form, if the underlying relationship is found to take such a form under the transformation.

Unfortunately, although several attempts were made to restate the relationship between the age-specific rate and the crude rate in a linear form, none of the transformations were successful. The results of the various transformations attempted are presented in Tables 8 and 9. No clear improvement of the non-linearity existing between the two variables is evident over the results of the original correlation. The correlation coefficients for the relationship between specific LFPR and the crude rate still remain very low for males and for females under 20 in developed nations.

4.4 Further Attempts for Improved Predictions

In the hope to improve the correlations between the age-specific rate and the crude rate, further attempts at improved prediction were made. A regrouping of the crude rates was done to search for possible linearity in the variables. After examining the scattergrams for males and for females under 20 (Figure 7A-7G and 8A-8B) in the developed countries, the crude rates were stratified. Since the participation rate of children below 15 is very low in

developed countries and the record of labour force participation for this age group is fragmentary, the age group under 15 years was excluded in these and subsequent analyses.

For males in the developed nations, the scattergrams reveal some of the crude rates showing extreme deviation from the linearity at both the upper and lower ends. For the age groups 15-19, 20-24 and 65+, extreme deviant cases were found in the crude participation rates (CPRs) above 60.0% and below 54.6%. For the remaining age groups some deviant cases were shown below a CPR of 53.2% at the lower end. Hence, the crude rates were stratified into two groups (Table 10). In the first group (CPR1), including age groups 15-19, 20-24 and 65+, the stratification excludes a CPR above 60.0% and below 54.6%. For the second group (CPR2), consisting of age groups 25-44, 45-54 and 55-64, a CPR below 53.2% is excluded. That is, the crude rates of 54.6 to 60.0 per cent inclusive were stratified for the age groups 15-19, 20-24 and 65+. The crude rates between 53.2 to 64.4 per cent were stratified for the rest of the age groups (i.e., age groups 25-44, 45-54 and 55-64).

Females under 20 in the developed countries were classified into two separate groups; one for which the CPR was between 14.1 to 29.3 per cent and the other where it was between 31.7 to 49.1 per cent. The results of the regression analysis obtained after splitting the crude rate into two groups are shown in Table 10.

TABLE 8

CORRELATION COEFFICIENTS BETWEEN AGE-SPECIFIC
LABOUR FORCE PARTICIPATION RATES AND
CRUDE PARTICIPATION RATE AFTER TRANSFORMATION (T)*

DEVELOPED COUNTRIES
(MALES)

AGE GROUP	ORIGINAL CORRELATION	T1	T2	T3
Under 15	-.11396	-.26538	-.26483	-.10853
15 - 19	.15563	.14429	.13963	.15018
20 - 24	.10761	.10546	.09654	.10654
25 - 44	.30874	.30718	.29717	.30796
45 - 54	.37767	.37554	.36269	.37661
55 - 64	.24048	.23180	.21871	.23612
65 and above	.21608	.27178	.25390	.24757

(FEMALES)

AGE GROUP	ORIGINAL CORRELATION	T1	T2	T3
Under 15	-.10992	-.14626	-.13979	-.17475
15 - 19	.02323	.01004	.06236	.01660

*
T1:   Ln(ASLFPR) = A + B (CPR)
T2:   Ln(ASLFPR) = A + B Ln(CPR)
T3:   SQRT(ASLFPR) = A + B (CPR)

TABLE 9

R-SQUARE MEASURE OF LINEAR REGRESSION OF AGE-SPECIFIC
LABOUR FORCE PARTICIPATION RATES (LFPRs)
AND TRANSFORMED LFPRs ON CRUDE PARTICIPATION RATE (T)*

DEVELOPED COUNTRIES
(MALES)

AGE GROUP	ORIGINAL R-SQUARE	T4	T5
Under 15	.01299	.02243	.07048
15 - 19	.02422	.04415	.03238
20 - 24	.01158	.06347	.05698
25 - 44	.09532	.15563	.15193
45 - 54	.14263	.24313	.23667
55 - 64	.05783	.17233	.15408
65 and above	.04669	.26488	.25775

(FEMALES)

AGE GROUP	ORIGINAL R-SQUARE	T4	T5
Under 15	.01208	.01509	.02178
15 - 19	.00054	.06570	.09841

*

T4: $ASLFPR = A + B/X + C/X^2$

T5: $Ln(ASLFPR) = A + B + CX^2$

TABLE 10

CORRELATION COEFFICIENTS BETWEEN AGE-SPECIFIC
LABOUR FORCE PARTICIPATION RATES AND
CRUDE PARTICIPATION RATE BY GROUPING *

DEVELOPED COUNTRIES
(MALES)

AGE GROUP	ORIGINAL CPR	CPR1	CPR2
15 - 19	.15563	.15820	-
20 - 24	.10761	.22981	-
25 - 44	.30874	-	.36067
45 - 54	.37767	-	.47122
55 - 64	.24048	-	.37554
65 and above	.21608	.42118	-

(FEMALES)

AGE GROUP	ORIGINAL CPR	CPR1	CPR2
15 - 19	.02323	.15041	-.39815

*
  Males: Original CPR = 50.1% - 64.4%
          CPR1 = 54.6% - 60.0%
          CPR2 = 53.2% - 64.4%

  Females: Original CPR = 14.1% - 49.1%
            CPR1 = 14.1% - 29.3%
            CPR2 = 31.7% - 49.1%

The correlation coefficients between the age-specific rates and the crude rate have somewhat improved after the regrouping. This indicates that a linear relationship, though not very strong, does exist between the two rates under examination. Further research in this area is therefore in order.

However, the slightly improved correlations are not strong enough to make satisfactory predictions. Hence, for the males in developed countries, another set of model values is constructed by using the confidence limits of mean participation rates, while for the females in these countries, the age group (15-19) is excluded from the analysis.

4.5 Parameters for Prediction Equations

Since the correlation coefficients are high for both males and females in developing countries and also for females above 20 years of age in developed countries, these are capitalized on in developing a simple set of model tables of age-specific participation rates for a given set of crude rates. This is the first system of model tables built under the assumption that the correlations between the crude rate and the age-specific rates remain unchanged. The parameters of the regression equation for making the necessary predictions are provided in Table 11.

TABLE 11

MODEL AGE-SPECIFIC PARTICIPATION RATES FROM CRUDE RATES,
PARAMETERS OF PREDICTION EQUATIONS

DEVELOPING COUNTRIES

	MALES		FEMALES	
AGE GROUP	INTERCEPT	SLOPE	INTERCEPT	SLOPE
Under 15	-21.9928	0.5414	-0.9763	0.1933
15 - 19	-45.9137	2.1163	0.2795	1.4193
20 - 24	57.5229	0.6174	5.3434	1.5854
25 - 44	90.0930	0.1352	0.8852	1.7404
45 - 54	83.0608	0.2410	0.2096	1.7370
55 - 64	55.0253	0.6089	-0.6096	1.3981
65 and above	-30.9893	1.6991	-2.5355	0.8077

DEVELOPED COUNTRIES

FEMALES

AGE GROUP	INTERCEPT	SLOPE
20 - 24	31.5354	.9689
25 - 44	-11.8348	1.9966
45 - 54	-11.0650	1.9303
55 - 64	.9175	.9713
65 and above	-2.4674	.3555

For the males in developed countries, another set of model tables of age-specific participation rates for a given set of crude rate is developed. This set of model tables is built under the confidence limits of the mean age-specific participation rates for given set of crude rate. Three sigma limits were calculated from the average age-specific participation rates and crude rate. The parameters of the three sets of regression equations for making predictions are given in Table 12. Since the deviations (standard error of the mean) from the mean participation rates are small, these three sets of values are employed as the prediction equations for the male model tables in developed countries.

4.6 Discussion

There have been a number of difficulties encountered in the course of this study. The most important problem encountered has been the low correlations found between the age-specific rate and the crude rate for males in developed countries. Although various data transformations were made, no improvement in correlations ensued. The scattergrams indicate clear deviation from linearity between the two rates. In fact, a very irregular pattern has been shown between the variables under examination.

TABLE 12

CONFIDENCE LIMITS OF

MEAN AGE-SPECIFIC PARTICIPATION RATES AND CRUDE RATE

DEVELOPED COUNTRIES
(MALES)

AGE GROUP	$\overline{X} - 3 \ (\emptyset x / \sqrt{n})$	$\overline{X}$	$\overline{X} + 3 \ (\emptyset x / \sqrt{n})$
15 - 19	43.2874	48.8914	54.4954
20 - 24	82.3169	84.6286	86.9403
25 - 44	96.2670	96.8286	97.3903
45 - 54	93.3451	94.3514	95.3577
55 - 64	72.6161	77.7229	82.8297
65 and above	18.5968	26.3343	34.0718
CRUDE RATE	55.7158	57.3429	58.9700

However, when regression analysis was done on separate sets of crude rates, the correlations between the rates improved slightly. Unfortunately, the data base employed for the developed countries (35 cases) is not large enough to permit further breakdown and a meaningful analysis.

The second major difficulty arose from the broad age-grouping in the Year Book used for data generation. A good deal of information on the labour force has been lost due to the grouping together of all those aged 25 to 44. While the Year Book has recent data with detailed age-groupings for many of the developed nations, such data are not available for developing regions. In order to do international comparisons, detailed age data of the type found mainly in developed countries cannot be employed. Hence, further research in the field, especially in the acquisition of other sources of data is highly recommended for complete understanding of the phenomenon.

5. Model Working Life Tables

Working life refers to the average number of years that a person may spend in the labour force. As direct information on working life is seldom collected, working life is estimated through the construction of working life tables. Tables, measuring the average length of working life expectancy (WLE), are especially useful in studying the economic implications of changes in labour force participation rates (LFPRs) and in evaluating human investments.

The working life table methodology is dicussed in detail in the United Nations Manual (U.N., 1968). The basic ingredients of the working life table are age-specific participation rates and an appropriate life table. "Working life tables represent the life-cycle of economic activity in hypothetical cohorts, that is, generations of males or females subject at each period of their lives to given rates of mortality and of participation in economic activities" (U.N., 1968:19). The set of model age-specific LFPRs with the model West, North, East and South life tables can be used to generate model working life tables. A discussion on the WLE methodology is given in Appendix A.

The model working life table is a device designed to answer questions such as "what is the working life expectancy of a person of a given age?". The mortality level and the crude participation rate (CPR) of a population are the basic information required to use this device. These two indicators can easily be obtained through conventional demographic data collection systems.

5.1 Construction of Model Working Life Tables

"Ideally, the data requirement for the construction of working life tables would be records (rates) of entries into and exits from the work force at each age in the same manner as death statistics are available and used in the calculation of life tables. In practice, such records are not generally available, and therefore the working life table can based instead upon the proportion of population in the labour force at each age (i.e. labour force participation rates). This is also known as "the worker rate" (wx)". (Gnanasekaran & Montigny, 1971:71).

The basic data required for the construction of this set of model working life tables are:

1. worker rate based on slope and intercepts from the regression analysis (or based on the mean age-specific participation rates for the males in developed countries), and

2. lx and Lx values of the regional model life tables

constructed by Coale and Demeny (1966).[2]

The regression equations are used to predict age-specific participation rates for both males and females for given levels of CPRs. The model life tables are used to indicate mortality levels. The two are combined to generate the model working life tables. In this study, the West model is employed for the developing countries, while the North, South and East models are chosen for the developed countries which have very high life expectancy compared to the world average.

----

[2] Regional model life tables, published by Coale and Demeny in 1966 are used in this study to indicate the various levels of mortality. These models consists of four sets of model life tables namely, West, East, North and South. These models elaborate four families of model patterns of mortality. Each set of model life tables contains 24 tables, calculated for males and females separately, with equal spacing of the values of the life expectancy at birth. For each set, life expectancy ranges from 20 years (level one) to 77.5 years (level 24).

The West table is based on some 125 life tables covering the experiencies of 20 countries. The countries included are Australia, U.S.A., Canada, Japan and Taiwan. The West table shows a mortality experience which does not deviate in general pattern from the world average. The East tables covers mainly Central European countries, while the North and the South tables are derived mainly from Scandinavian and Southern European countries respectively. These three groups reveal age patterns with substantial deviations from the world average. The use of the East, North and South models is preferred only if there is evidence suggesting that the mortality in the population has similar characteristics as these three models. Otherwise, the use of the West Model is recommended.

5.1.1 Functions of Working Life Tables

A working life table traces the labour force participation (LFP) of a cohort of 100,000 males or females throughout its life cycle. The stationary population (Lx) and the worker rates (Wx) are the basic ingredients of the working life table. The life tables show the number of persons out of the 100,000 at birth who can be expected to survive to exact ages 10, 15, 20 etc., according to the level of mortality at different age. The lx column in the life tables refers to the number of survivors at age x out of an original cohort of 100,000, while the Lx column indicates the number of person-years lived between age x and x+n. The Lx value yields the age distribution in a stationary population. The number of persons in this stationary population at each age group who are expected to be in the labour force is then calculated by applying the respective age-specific labour force participation rate.

The worker rate (Wx) is the ratio of the number of persons in the labour force to the number of persons in the population in an age interval between age x and age x + n. The number of survivors in the labour force at age x from the orginal 100,000 cohort is represented by lwx, while Lwx is the total number of years of LFP experienced in the age interval between age x and age x + n. The equation: Lwx = wx (Lx) yields the stationary population. Twx = summation of Lwx, is the total number of years of work activity remaining to survivors in the labour force at age x. The

years of working life expectancy is given by ewx. It is the average number of years of LFP remaining to survivors in the labour force at the given age, and is calculated by: ewx = Twx/lx.

The nature of the life table methodology is such that migration is ruled out. Under this assumption, no exit from the labour force is allowed except for retirement or death. Only members of the stationary population may enter or leave the labour force. The total number of years that a person spends between entry and exit is the length of the working life. It is important to note that the working life does not necessarily imply the number of years of actual work because periods of unemployment and part-time employment may be included. The various functions used to construct the model working life table are listed in Appendix A.

5.2 Sets of Model Tables

The model working life tables are constructed and the working life expectancy by age is shown for different levels of crude participation rates (Appendices B and C). The levels of life expectancy (LE) associated with each set of model life tables employed in the study are as follow:

1. Model West (Males: Level 7-23, (LE) = 32.48 - 71.19)

2. Model West (Females: Level 7-23, (LE) = 35.0 - 75.0)

3. Model North (Males: Level 19-24, (LE) = 61.3 - 74.4)

4.   Model   North (Females: Level 17-24, (LE) = 60.0 - 77.5)

5.   Model   South (Males: Level 19-24, (LE) = 61.2 - 73.6)

6.   Model   South (Females: Level 17-24, (LE) = 60.0 - 77.5)

7.   Model   East (Males: Level 19-24, (LE) = 60.7 - 72.7)

8.   Model   East (Females: Level 17-24, (LE) = 60.0 - 77.5)

The statistics on the number of children below 15 years of age participating in the labour force are not directly comparable. This is a result of differences in the minimum age adopted for enumeration of the labour force in various countries. Therefore, in computing the age-specific rate, it has been assumed that all such persons were 10-14 years.

A total of 45 model working life tables have been constructed in this study which covers the entire range of labour force participation in the world today. Two sets consisting of nine tables each are for males and females in developing countries, while another set of fifteen tables is devoted to females in developed countries. For the males in developed countries, a separate set of twelve tables has been prepared.

Crude participation rates (CPRs) ranging from 20 to 75 at an interval of five are assigned to males in developing countries, while for females in these countries, the range is 2 to 55 with the same interval. The range of the CPR for females in developed countries is from 10 to 65 at a spacing of five. Three sets of CPRs (56, 57 and 59) are used for the males of developed countries. A complete set of these

tables is provided in Appendices B and C. Several applications of these working life tables for both developed and developing nations are provided in the next chapter. With necessary modification, this set of model working life tables can be applied to many countries for estimating the length of working life. Although the results may not yield actual years of working life expectancy (WLE) for any particular country at a given level of crude participation rate, the average WLE so estimated is a good approximation of working life for countries without such data.

5.3 Patterns in Working Life Expectancy

The Population Reference Bureau (PRB) 1980 World Population Data Sheet indicates that the average life expectancy at birth for the less developed countries is 57 years. Lower life expectancy (45 years) is found in the region of Middle Africa and higher life expectancy (68 years) is evident in Temperate South America. West model levels 11, 17 and 21 (in Appendix B) cover the present day mortality levels in the developing countries.

From the model tables, we see some interesting age patterns in working life. For males, for higher participation and low mortality levels, the age pattern of working life is L-shaped. Otherwise, it is of the inverted U-type. For females, except for the lowest mortality level, the pattern is of an inverted U-typed. Thus, as mortality

improves, a shift in age pattern is noticed. It appears that the level of modernization and the increased participation in non-agriculatural activities are responsible for changing pattern of labour force participation (LFP). At the higher levels of industrialization, females take an increasing part in the labour force through changes in the occupational structure and educational opportunities, coupled with declining fertility.

The Year Book (ILO, 1978) has recorded the lowest crude participation rate (LP) of 36.8% (Surinam) for males and 1.9% (Algeria) for females in developing countries. The highest crude rates (HP) noted for such countries are 61.3% (Guinee-Bissau) and 52.2% (Empire Centrafricain) for males and females respectively. This information was utilized to construct two examples of WLE for both sexes (Figures 9 and 10). West model level 11 is a good approximation of the high mortality rate (HM), while level 21 is good for the low mortality rate (LM). The selected levels of mortality and participation are as follows:

Males:

    (LP = CPR of 35%, HM = life expectancy of 42.1 years)

    (HP = CPR of 60%, LM = life expectancy of 66.0 years)

Females:

    (LP = CPR of 2%, HM = life expectancy of 45.0 years)

    (HP = CPR of 50%, LM = life expectancy of 70.0 years)

The working life expectancy for males in developing countries is shown in Figure 9. For low participation and a high mortality rate (LP:HM), the age pattern of male working life is an inverted U-type. The same pattern remains as participation and mortality conditions improve. For females, at a low level of participation and poor mortality conditions, the pattern is linear L-shaped (Figure 10). At high levels of participation and low mortality rate (HP:LM), the age pattern of working life is an inverted U-shape. Thus, as participation and life expectancy increase, the female age curve changes its shape. As noted previously, in the process of industrialization and modernization, the female LFP pattern can be affected by changes in the life cycle of marriage and family; in the occupational structure; and in educational opportunities.

At the higher levels of economic development, women play an increasing role in the labour force, as employment opportunities expand through increases in non-agricultural activities and educational opportunities. Such opportunities are coupled with reductions in fertility and household duties.

FIGURE 9

MALE WORKING LIFE EXPECTANCY — DEVELOPING COUNTRIES
(MODEL WEST)
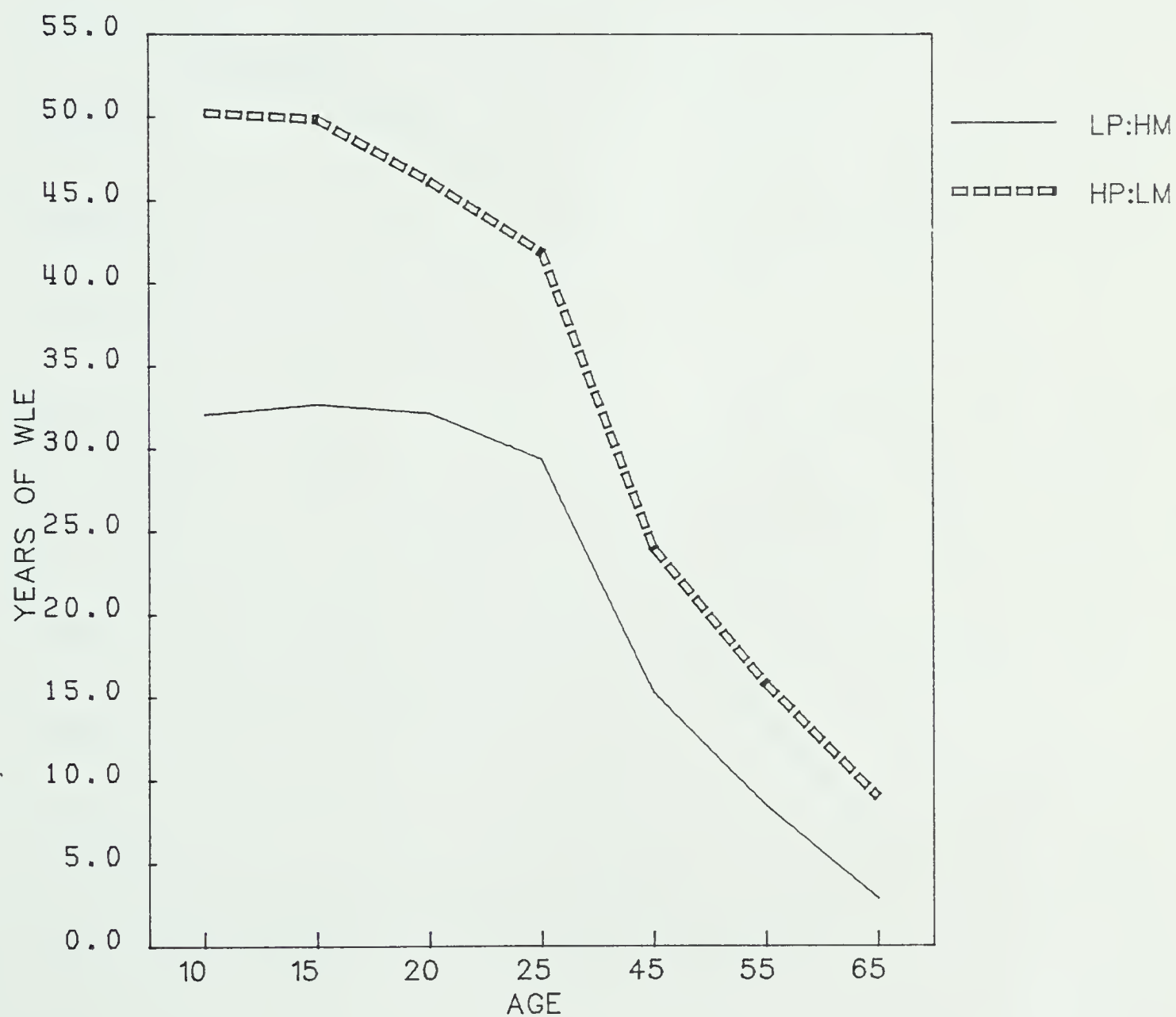
FIGURE 10

FEMALE WORKING LIFE EXPECTANCY — DEVELOPING COUNTRIES
(MODEL WEST)
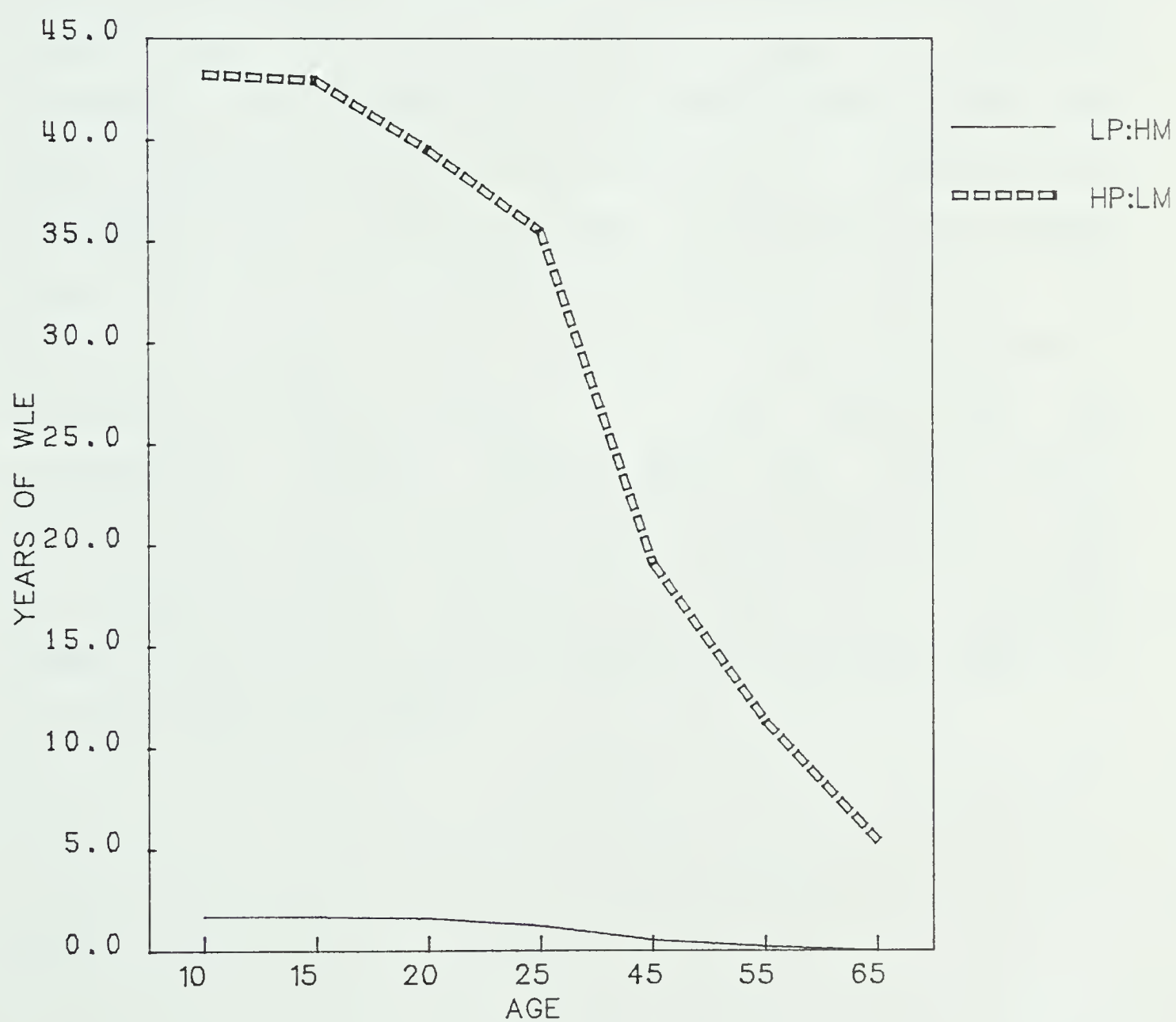
5.4 Discussion

5.4.1 Relation between Mortality and Working Life Expectancy

In drawing economic conclusions from the impact of changes in mortality level on working life expectancy (WLE) in the developing countries, attention should be paid to changes in other demographic factors as well. A gain in WLE could be expected if mortality in developing countries is lowered, but this does not mean a gain in economic advantage. As suggested by the United Nations (1962), the benefit depends on whether such a decline in mortality is accompanied by a decline from the high fertility levels prevailing in many developing countries, since it is fertility rather than mortality which determines a population's age structure. It also determines the relationships between groups which are likely to be producers and those which are likely to be dependants. The anticipated economic advantage derived from the increased number of years of WLE may be offset by the large number of children demanding support.

6. Applications

73

The model working life tables measure the average number of years that a person may spend in the labour force. With necessary adjustment of a country's labour force participation (LFP) pattern, these model tables can be useful devices in making labour force projections, estimating returns from manpower investment and assessing socio-economic changes in LFP. Applications of the model tables to both developing and developed countries are provided by the following examples.

6.1 Example 1: Benin

Benin in West Africa had a male crude participation rate (CPR) of 53.3 percent in 1977. The Year Book (1979) has not shown any age specific rates. What is the working life expectancy (WLE) of males?

The life expectancy in Benin in 1980 according to the PRB World Population Data Sheet is 46 years. So West model level 11 is a good approximation of mortality conditions. Simple linear interpolation yields a WLE of 37.8 years at age 10, and 6.0 years at age 65.

6.2 Example 2: Jordan

The Household Survey of 1976 in Jordan has shown a female work participation rate of 4.4 per 100. The PRB data sheet notes the Jordanian life expectancy of 56 years at birth. Applying the two together, the female working life expectancy at age 10 is nearly 3.54 years and at age 15 some 3.60 years.

6.3 Example 3: Bolivia, Bangladesh, and Mauritania

The Year Book (1981) has shown the male and female crude participation rates for Mauritania in Africa, Bolivia in Latin America, and Bangladesh in Asia as follows:

Bolivia in 1980: Males = 51.2% Females = 14.4%

Bangladesh in 1974: Males = 53.0% Females = 2.5%

Mauritania in 1975: Males = 59.9% Females = 2.6%

The years of life expectancy, according to the 1980 PRB data sheet, are 47 for Bolivia, 46 for Bangladesh, and 42 for Mauritania. Hence, West model level 11 gives approximate levels of mortality for the three developing countries.

6.3.1 Bolivia

Bolivia has the lowest male crude rate and highest female crude rate among the three countries. Estimates of working life expectancy (WLE) were obtained through simple

linear interpolation of two adjacent values in the model table. The interpolation yields a male WLE of 36.8 years at age 10, and 5.7 years at age 65. For females, the WLE at age 10 is 10.1 years and for age 65, it is only 1 year (Table 13).

Suppose the mortality conditions in these countries had reached the North American level, keeping crude participation rate (CPR) constant. How many years of increase in WLE could be anticipated? Table 14 reveals that at a higher level of life expectancy, the male WLE will increase to 49.1 years at age 10 with a gain of 12.3 years. At age 65, the gain is 2 years. This would mean an increase of 2.9 years of WLE for females at age 10 and one of .4 years at the retirement age.

Labour force participation rates are especially low for females in developing countries. If the female CPR had reached the North American level of 38.4% (keeping mortality conditions constant), more gains in WLE could be obtained. A significant increase in female WLE of all age groups is revealed in Table 15. At higher participation rates, a Bolivian girl aged 10 gains 16.5 years in WLE. At age 65, the increase is 2.2 years. Since Bolivia has the highest female CPR, the number of years gained in WLE is comparatively less than the other two countries.

TABLE 13

WORKING LIFE EXPECTANCY, DEVELOPING COUNTRIES
MORTALITY LEVEL=11 (WEST)

MALES

(LIFE EXPECTANCY = 42.1)

CPR	51.2	53.0	59.9
AGE	BOLIVIA	BANGLADESH	MAURITANIA
10	36.8	37.3	39.4
15	37.2	37.7	39.6
20	35.1	35.4	36.6
25	31.9	32.2	33.2
45	17.9	18.2	19.3
55	11.3	11.6	12.7
65	5.7	6.0	7.2

FEMALES

(LIFE EXPECTANCY = 45.0)

CPR	2.5	2.6	14.4
AGE	BANGLADESH	MAURITANIA	BOLIVIA
10	2.0	2.0	10.1
15	2.0	2.1	10.2
20	1.9	1.9	9.5
25	1.5	1.5	8.4
45	.6	.7	4.5
55	.3	.3	2.5
65	.0	.0	1.0

TABLE 14

WORKING LIFE EXPECTANCY, DEVELOPING COUNTRIES
MORTALITY LEVEL=23 (WEST)

(USING NORTH AMERICAN MORTALITY LEVEL)

MALES

(LIFE EXPECTANCY = 71.2)

CPR	51.2	53.0	59.9
AGE	BOLIVIA	BANGLADESH	MAURITANIA
10	49.1	49.9	53.0
15	48.9	49.7	52.6
20	46.0	46.5	48.7
25	41.7	42.2	44.2
45	23.2	23.7	25.6
55	14.7	15.2	16.9
65	7.7	8.1	9.7

FEMALES

(LIFE EXPECTANCY = 75.0)

CPR	2.5	2.6	14.4
AGE	BANGLADESH	MAURITANIA	BOLIVIA
10	2.4	2.5	13.0
15	2.4	2.5	12.9
20	2.2	2.3	11.9
25	1.7	1.8	10.5
45	.7	.7	5.5
55	.3	.3	3.2
65	.0	.0	1.4

TABLE 15

FEMALE WORKING LIFE EXPECTANCY, DEVELOPING COUNTRIES

MORTALITY LEVEL=11 (WEST)
(LIFE EXPECTANCY = 45.0)

(USING NORTH AMERICAN CRUDE PARTICIPATION RATE)

		BANGLADESH	MAURITANIA	BOLIVIA
CPR	38.4	38.4	38.4	38.4
AGE	WLE	CHANGES IN YEARS OF WLE		
10	26.6	+24.6	+24.6	+16.5
15	26.9	+24.9	+24.8	+16.7
20	24.9	+23.0	+23.0	+15.4
25	22.4	+20.9	+20.9	+14.0
45	12.3	+11.7	+11.6	+7.8
55	7.0	+6.7	+6.7	+4.5
65	3.2	+3.2	+3.2	+2.2

6.3.2 Bangladesh

Bangladesh has the lowest female crude participation rate (CPR) and a moderate male CPR compared with the other two countries. At the North American level of mortality, a Bangladesh male at age 10 could expect to work 49.9 instead of 37.3 years; an increase of 12.6 years (Table 14). At age 65, the increase is 2.1 years. For females at age 10, only .4 years in working life expectancy (WLE) is added. No females are expected to work at age 65.

However, if the female CPR were at a higher level, as in North America, the gain in WLE could be much more. Whereas a 10-year old girl will probably continue to work for about 2.0 years at CPR of 2.5%, the comparable figure at a crude rate of 38.4% is 26.6 years (Tables 13 and 15). A woman at age 65 will be expected to work for another 3.2 years. Hence, much larger gains in female WLE result from obtaining a higher level of participation, not from higher life expectancy.

6.3.3 Mauritania

Mauritania has the highest male crude participation rate (CPR) among the three countries. Her low female CPR is far lower than Bolivia, but very close to that of Bangladesh. At age 65, like Bangladesh, no women are expected to continue working.

At the North American level of mortality, there is a gain of 13.6 years for males at age 10, and of 2.5 years at

age 65. An increase of only half a year is found for girls aged 10. Again, no women will be expected to work at 65 years of age (Table 14). However, if the female CPR increases to a higher level, a gain of some twenty years in working life expectancy (WLE) is anticipated at age 10 (Table 15).

The WLE can be used as an indicator of modernization. If the third world nations reach North American mortality conditions, a one third (about 13 years) increase in male WLE may be anticipated. However, an increase in CPR will bring many more years of female WLE to the developing countries, especially those countries with low female labour force participation.

6.4 Further Applications

6.4.1 Example 4: Female working life expectancy, Canada 1921-71

In general, only male working life tables have been prepared in Canada. (Denton and Ostry, 1969: Gnanasekaran and Montigny, 1971; Stafford and Roberts, 1975). However, female labour force participation has increased remarkably over time, contributing significantly to the Canadian economy. It was reported in the 1976 Census that close to four million women were working or seeking jobs. This figure is more than three times the number 25 years ago, and

almost 14 times that in 1901 (Statistics Canada, 1980:1).

Moore (1975:221) suggests that the great increase in the number and proportion of women in the labour force is due to a combination of demographic, economic, and social developments. Among demographic factors, the most important are the overall growth in population and the increased ratio of women to men resulting from the greater longevity of women. In addition, earlier marriages and smaller families have led to a significant reduction of the age at which women complete their childbearing. Important economic and social factors include the transformation of Canada from a rural agrarian to an urban industrialized society.

So far, only two attempts have been made to estimate female working life in Canada (Krishnan, Penning and Kurian, 1980 and Stafford-Roberts, 1975). However, the approach used by Krishnan, Penning and Kurian employs a different rationale from that used here. Stafford-Roberts' (1975) working life table for females in Alberta does not adjust the data for the bimodality pattern. Therefore, an attempt is made here to provide an alternate set of estimates of working life expectancy in Canada.

6.4.2 Data and Methodology

Data on the female population are taken from Census of Canada, 1921 through 1971. Crude participation rate (CPR) data are obtained from the same source as the population

data (Table 16). For comparison purposes, another set of estimates for the year 1971 are prepared with the life table values for 1970-1972 and the 1971 CPR. This set of estimates is used to compare with the results obtained from the model-tables. North, South and East model working life tables have been utilized to generate estimates of female WLE in Canada from 1921 to 1971. Estimates of working life at the lower limit of the various age groups have been obtained through simple interpolation of the values gleaned from two adjacent model tables. Tables 16 and 17 present the CPR values and estimates of WLE for the years 1921 to 1971. For 1971, an additional set of estimates using the 1970-1972 life-table values and the CPR has been prepared and is shown in Table 18.

6.4.3 Findings

A significant increase in the working life expectancy (WLE) of females aged 20 and above is revealed over the years 1921 to 1971 in all three models (Table 17). This marked rise in female WLE is due to many factors. These include: the rapid growth in the service sector of the economy along with better employment opportunities, increased education and vocational training, the decrease in family size, and better provision of day care facilities and maternity leave.

TABLE 16

RATIOS OF THE TOTAL ECONOMICALLY ACTIVE POPULATION TO

THE TOTAL POPULATION OF ALL AGES, CANADA: 1921-1971

YEAR	(1) POPULATION	(2) LABOUR FORCE	(2)/(1) CRUDE PART'N RATE
1921	4,258,306	562,000	13.2%
1931	5,002,245	752,000	15.0%
1941	5,606,119	939,000	16.7%
1951	6,920,556	1,188,000	17.2%
1961	9,019,354	1,774,000	19.7%
1971	10,772,940	3,053,095	28.3%

Source: Census of Canada, 1971.

F.T. Denton and S. Ostry, Historical Estimates
of the Canadian Labour Force, Ottawa, 1967,
Tables 3-5, 8 and 9.

TABLE 17

FEMALE WORKING LIFE EXPECTANCY, CANADA: 1921-1971

	1921	1931	1941	1951	1961	1971
CPR (%)	13.2	15.0	16.7	17.2	19.7	28.3
LIFE EXPECTANCY*	60.8	62.1	66.3	70.8	74.2	76.4
MORTALITY LEVELS USED	17-19	17-19	19-21	21-23	21-23	23-24

(MODEL NORTH)

AGE			YEARS OF WLE			
20	7.4	8.8	10.2	10.8	12.9	19.7
25	5.3	6.6	8.0	8.5	10.5	16.8
45	2.8	3.3	4.0	4.2	5.2	8.1
55	1.5	1.8	2.0	2.2	2.6	4.0
65	.3	.4	.5	.6	.7	1.3

(MODEL SOUTH)

AGE			YEARS OF WLE			
20	7.6	9.0	10.5	11.0	13.2	19.9
25	5.5	6.8	8.2	8.6	10.6	17.0
45	2.9	3.4	4.0	4.3	5.3	8.3
55	1.5	1.8	2.1	2.2	2.7	4.1
65	.3	.4	.5	.6	.8	1.4

TABLE 17 (Cont'd)

FEMALE WORKING LIFE EXPECTANCY, CANADA: 1921-1971

	1921	1931	1941	1951	1961	1971
CPR (%)	13.2	15.0	16.7	17.2	19.7	28.3
LIFE EXPECTANCY*	60.8	62.1	66.3	70.8	74.2	76.4
MORTALITY LEVELS USED	17-19	17-19	19-21	21-23	21-23	23-24

(MODEL EAST)

AGE			YEARS OF WLE			
20	7.5	8.9	10.3	10.9	13.0	19.8
25	5.4	6.7	8.0	8.5	10.5	16.8
45	2.8	3.3	3.9	4.2	5.2	8.1
55	1.5	1.7	2.0	2.1	2.6	3.9
65	.3	.4	.5	.5	.7	1.3

In Figures 11 to 13, interesting patterns in female working life are found. For low participation and low mortality levels as in 1921, the age pattern of working life is linear L-shaped. For higher levels of mortality and higher participation rates as in 1971, the pattern is non-linear L-shaped. Thus, as the level of mortality and participation improve, a shift in age patterns is found.

The three models in Table 17 reveal that whereas a 20-year old woman will probably continue to work for about 20 years in 1971, the comparable figure for 1921 is 7.5 years. For women aged 25-44, the WLE increased more than three-fold over the 60-year period, from 5.4 mean years in 1921 to 16.8 mean years in 1971. For the women aged 45-54, estimates of WLE tripled. That is, over time the WLE increased from 2.8 to 8.2 years during this 60-year period. In examining the female participation rates from 1921 to 1961, Ostry (1968:3) suggests that the greatest increase in labour force activity is demonstrated by women in the middle age groups, 35-44 and 45-54. The increase in participation by these middle-aged women has meant a marked increase in the participation of married women (presumably, women with children).

FIGURE 11

FEMALE WORKING LIFE EXPECTANCY FOR CANADA: 1921–1971
(MODEL NORTH)
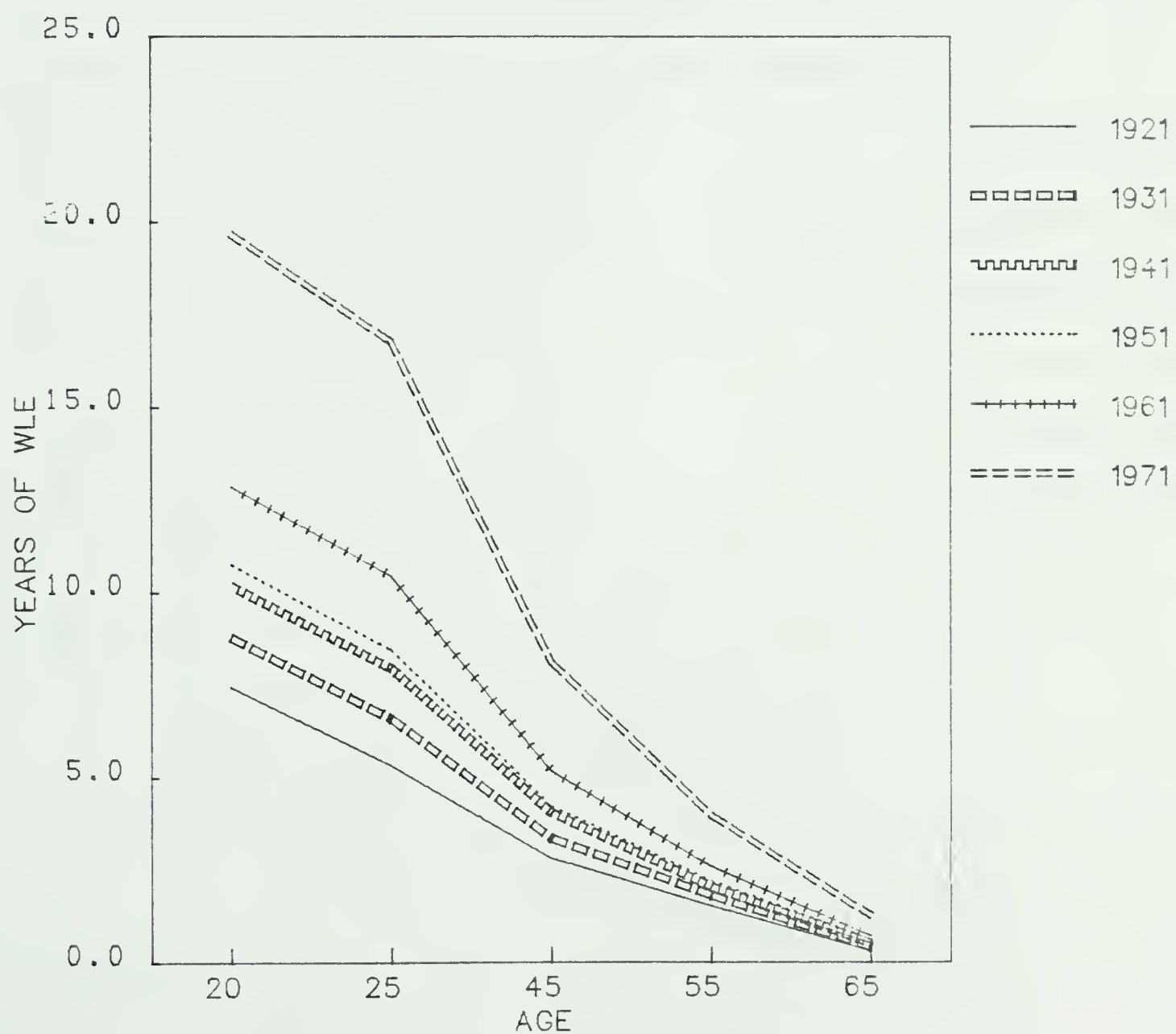
FIGURE 12

FEMALE WORKING LIFE EXPECTANCY FOR CANADA: 1921–1971
(MODEL SOUTH)
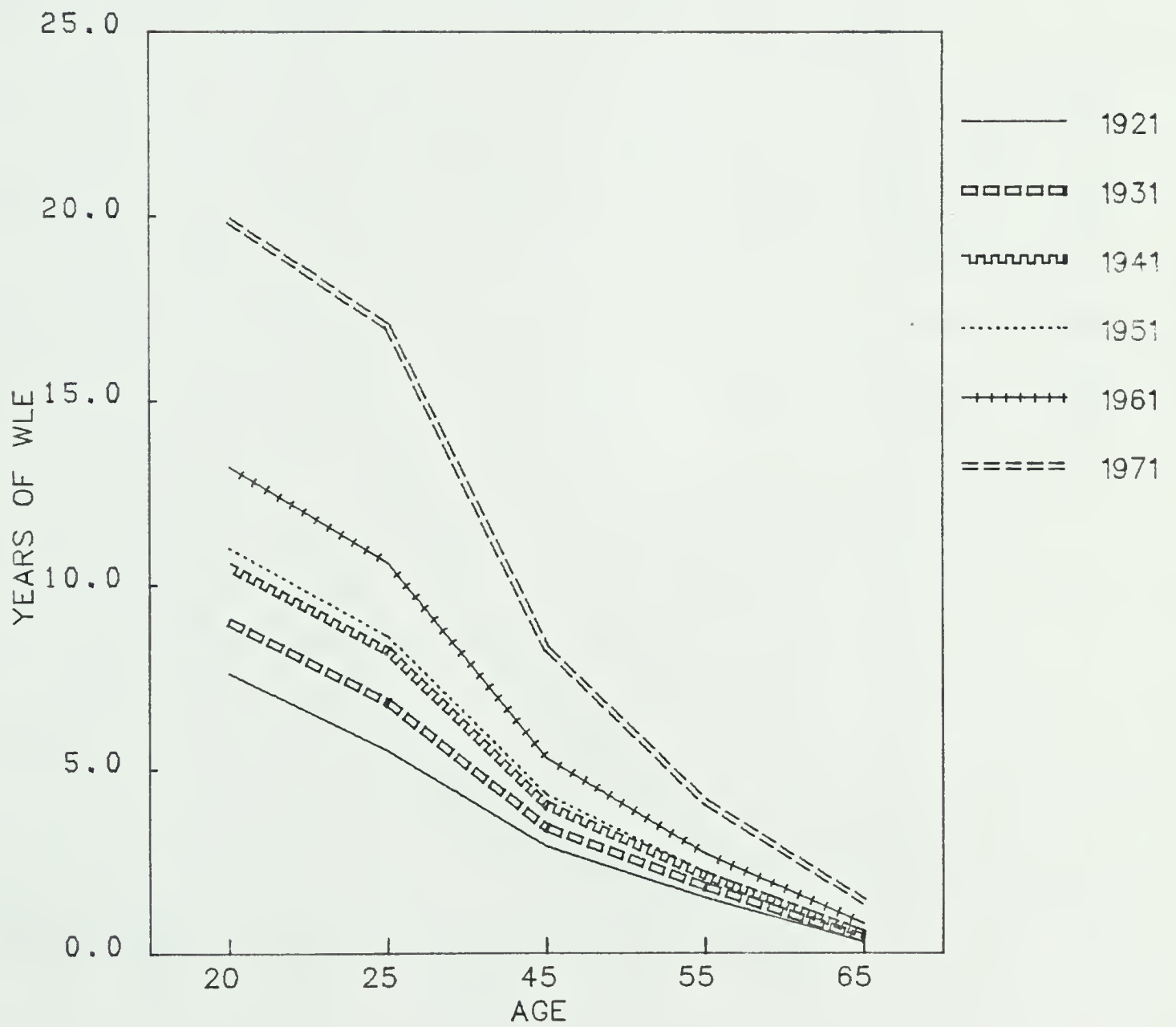
FIGURE 13

FEMALE WORKING LIFE EXPECTANCY FOR CANADA: 1921–1971
(MODEL EAST)
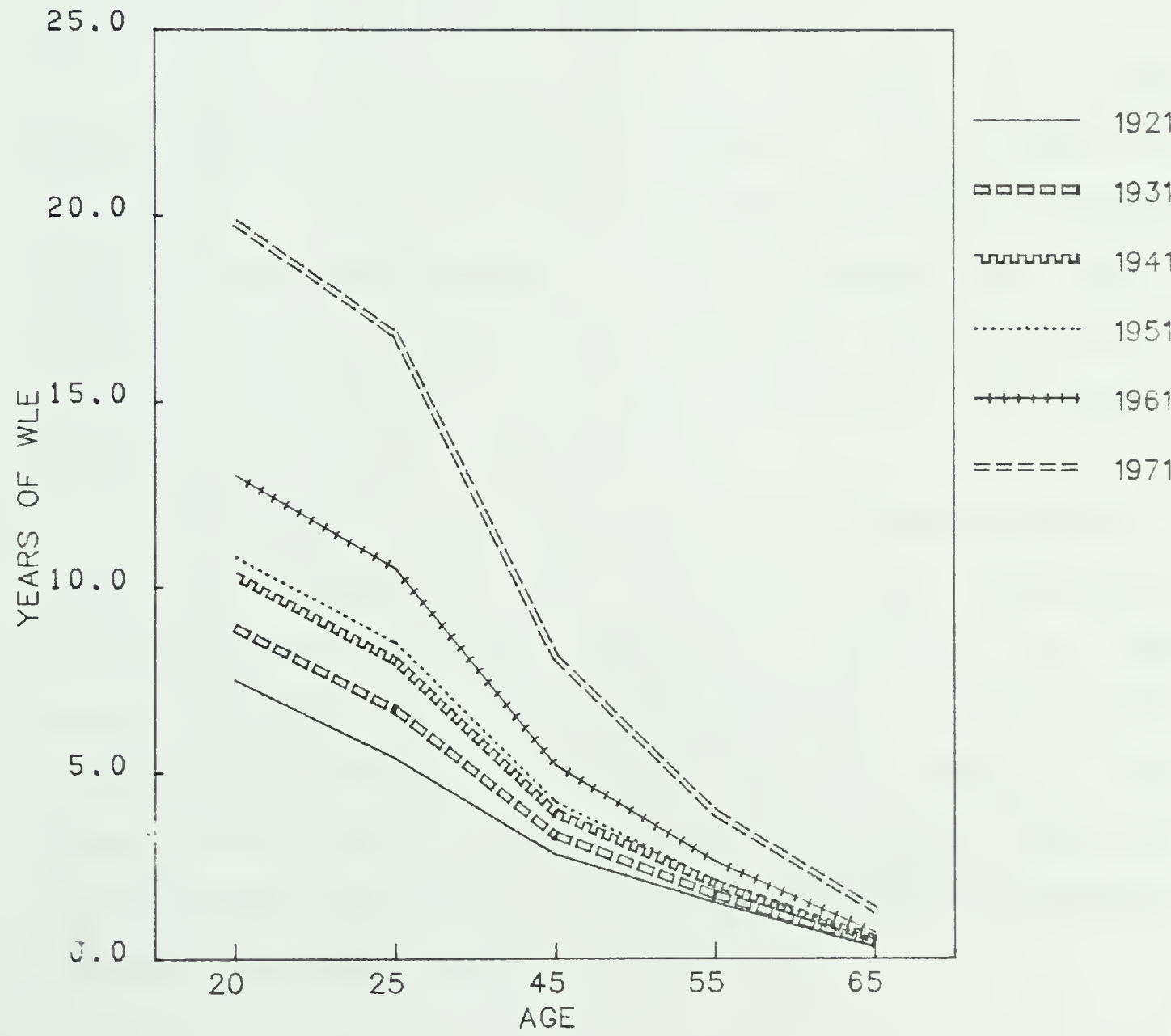
Chow and Tse's study (1981) on Canadian female LFP shows that after ages 25-34, the second phase of the female working life cycle appears with gradually rising participation to a second though considerably lower peak at ages 35 to 45. It has been suggested by Kalbach & McVey (1979: 276) that the emergence of the double-peak pattern for women, reflects the reentry of middle-aged women into the labour force as their children become less dependent upon their presence in the home.

Another interesting point to be noted is a slight upward-shifting in the average number of years spent in retirement. Under the 1971 mortality condition, a female aged 20 years could expect to live for another 56.4 years. Considering that her WLE is about 20 years, the remaining 36 years may be regarded as the number of years in retirement. In 1921, this was only some 33 years.

Let us look at the alternate set of estimates shown in Table 18. These are nearly the same as those indicated by the three models discussed, denoting a deviation of less than one year for any of the age groups. The East model table yields identical results for the age group 45 and above, and reveals a deviation of less than 0.2 years for the remaining age groups. Very close estimates are given by the other two model tables as well.

TABLE 18

FEMALE WORKING LIFE EXPECTANCY, CANADA 1971

(USING 1970-1972 LIFE TABLE VALUES)

AGE	YEARS OF WLE
20	19.6
25	16.7
45	8.1
55	3.9
65	1.3

6.4.4 A Comparison with the United States

It will be worthwhile to compare Canadian females with U.S. females with regard to working life. Terry and Sly (1972) have presented the results on working life expectancy (WLE) for women in the United States. It is useful to recall that our definition of labour force refers to those who are employed, as well as unemployed. Terry and Sly's study shows that at age 20, the future WLE for the temporarily inactive is 18.55 years, and the combined WLE for those still working in the first work period is 22.41 years. The WLE for the continually active is 45.8 years, while for those in the initial period of the temporarily active, it is 3.86 years. Hence, the estimates obtained in this paper for Canada (some 19.8 years at age 20) are very close to the U.S. figures for women at age 20 who are temporarily inactive.

It may be noted that, in the development of the model from the International Labour Office data, the bimodality problem did not appear as a result of the very broad age grouping used. If very detailed data, as Terry and Sly (1972) had, were available, one could have developed refined estimates of WLE by the various categories of females in the labour force.

6.5 Discussion

Special attention should be paid to the different definitions of the economically active population employed in various countries, especially in comparing the female activity rate internationally. In a great number of countries, many women are farm helpers or family workers without pay. In addition to this, are the differences in criteria for determining who are to be counted among the economically active population. As suggested by the United Nations, activity rates for young people should also be compared with caution due to variations among countries in the treatment of unpaid family workers, of persons seeking work for the first time, and of students engaged in part-time economic activities (ILO, 1979).

7. Summary and Conclusion

The length of working life is a good indicator of a country's economic-demographic situation. The aim of this study was to develop a system of model tables of labour force participation and working life for both males and females from data gathered on a world wide basis.

The data on economically active population (mid-year 1975) compiled by the 1978 Year Book of Labour Statistics have been utilized in this study. The analysis was based on data from 35 developed (including Israel and Japan) and 112 developing countries. The patterns and the degree of relationships that existed between the crude and age-specific participation rates in countries with reliable data were exploited to construct the model tables. These sets of model tables can be used: to estimate the most probable working life expectancy for countries with incomplete data; to test the accuracy of existing estimates of working life expectancy; to indicate historical trends for countries with deficiency in the availablity of long-term data for computation of working life expectancy over time; and to make labour force projections by utilizing the different levels of mortality and crude participation rates.

The basic rationale behind the methodology was that, if the correlation between an indicator and another was high,

one of them was a satisfactory predictor of the other.

The model tables can provide a scheme to estimate working life with the aid of an estimate of the crude participation rate and also of the level of mortality. Regression techniques were utilized in the development of the model tables.

Participation rates of the youngest and oldest males tend to fall as economic development progresses. That is, the age of male entry into the labour force rises and the age of retirement falls. The pattern of male labour force participation is of the inverted U-type in both developed and developing countries. The age curves of female labour force participation rates may take diverse forms. In view of the broad age grouping done in the data generation, the bimodality of the distribution known in developed countries was not clearly revealed here.

Since the correlation coefficients were high for both males and females in developing countries and also for females above 20 years of age in developed countries, these were capitalized upon in developing a simple set of model tables of age-specific participation rates for a given set of crude rates. This is the first system of model tables built under the assumption that the correlations between the crude rate and the age-specific rates remain unchanged.

The basic data needed for the construction of the set of model working life tables are: (1) work rate based on slope and intercepts from the regression analysis, and (2)

lx and Lx values from the regional model life tables. A total of forty-five working life tables have been constructed in this study which covers the entire range of labour force participation patterns of the world today. The results of the model tables may not yield actual years of working life expectancy for any particular country at the given level of crude participation rate. However, the average working life expectancy assessed can be a good approximation for countries with no such data.

The model working life tables were built under the assumption that the pattern of correlation and the general levels of participation do not change rapidly. However, the general level of labour force participation and the association that exists among the age-specific rates are shaped by various changing social and economic conditions. A potential influence of economic cycle upon LFP pattern may exist. For example, changes in labour force participation patterns may occur during economic recession through changes in age-specific labour force participation rates. Participation rates for the younger age groups may be altered, especially for those under 20 years of age, since employment opportunities for labour market entrants will likely be diminished by recession conditions.

The labour force participation patterns may vary according to a country's social customs and economic development as well as its political situation. With modernization forces impinging on the developing countries,

changes in labour force participation can be anticipated for both males and females.

The pattern of working life is influenced by the combined result of work force participation and mortality conditions. The mortality conditions of the latter part of the 20th Century will not be the same as those now. However, these tables can be revised with more recent information on patterns of mortality and work force participation.

7.1 Suggestions for Further Research

The low correlation between the age-specific rates and the crude rate for males in developed countries was one of the major difficulties encountered in this study. Although several data transformations were made, no improvement in correlations resulted. When regression analysis was done on separate sets of crude rates, however, the correlations between the crude and age-specific rates improved slightly. The data base used for the developed countries (35 cases) was not large enough to permit further breakdown and a meaningful analysis, hence, further research in analysing the data base is needed to solve the problem of low correlations.

A good part of the useful information was lost owing to the broad age-grouping of the important age groups (into 25 to 44) from the Year Book data. The Year Book has recent

data with detailed age-groupings for many developed countries, but only few are available for developing countries. Investigations into the acquisition of detailed age-grouping data for developing countries are in order before making more precise international comparison possible.

Refined estimates of working life expectancy by the various categories in the labour force could have been developed, if very detailed data, as those used by Terry and Sly (1972) for American women, were obtainable. Research using labour force information on temporarily active, temporarily inactive and continually active workers ... etc. is extremely useful in developing estimates of working life expectancy by categories for developed countries.

The estimates obtained from the model tables are only gross indicators of economic-demographic conditions. Regional differences among countries may indicate various social, cultural, and institutional factors important in shaping the pattern of labour force participation, especially of women's participation. Further investigation is highly recommended for making a breakdown by regions and occupations possible.

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Appendix A

Methodology for Model Working Life Tables

Methodology for Model Working Life Tables

Working life is the average number of years that a person may spend in the labour force. A working life table traces the labour force participation of a cohort of 100,000 males or females throughout it life cylce. The table measures the working life expectancy of a person in the labour force at an exact age. The basic ingredients of the working life table are age-specific participation rates (also known as worker rates) and an appropriate life table. Thus, the basic data inputs used in constructing this set of model working life tables are: (1) worker rate based on slope and intercepts from the regression analysis (Table 11); and (2) lx and Lx values of the Coale and Demeny's (1966) regional model life tables.

The life tables show the number of persons out of the 100,000 at birth who can be expected to survive to exact ages 10, 15, 20, etc ., according to the level of mortality at different ages. The lx column in the life tables has made mortality allowances among the original cohort of 100,000 persons alive at successive ages. The number of persons (expected to be in the labour force) in this stationary population at each age is then calculated by applying the respective age-specific labour force participation rate (the proportion of population in the labour force at each age). Only members of the stationary population may enter or leave the labour force and the

population is closed to migration. The total number of years that a person spends between entry and exit from the labour force is called the "working life".

The mean working life expectancy at exact age x for persons in the labour force is referred to as the average number of years of labour force participation remaining to persons surviving at the given age. The expectation of working life is computed by dividing the total number of man-years in the labour force by the number of survivors at the beginning of the given age: $ew_x = Tw_x/l_x$. Tw_x refers to the cumulated economically active stationary population and l_x is the total number of survivors at each age. The various functions used to derive the expectation of working life are provided as follows, while an example of the computations is presented in Table A1.

Functions:

l_x - is the number of survivors at age x out of an original cohort of 100,000 in the life tables.

L_x - refers to the number of person-years lived between age x and x+n.

W_x - is the worker rate or ratio of the number of persons in the labour force to the number of persons in the population in an age interval between age x and age x + n.

Lwx - is the total number of years of labour force participation experienced in the age interval between age x and age x + n. The stationary population is given by the equation: Lwx = wx (Lx).

Twx - is the total number of years of labour force activity remaining to survivors who are in the labour force at age x (i.e., Twx = summation of Lwx).

ewx - is the years of working life expectancy. It is the average number of years of labour force participation remaining to survivors in the labour force at the given age. The statistics are computed by: ewx = Twx/lx.

TABLE A1

COMPLETE TABLE OF WORKING LIFE EXPECTANCY,
A MODEL WORKING LIFE TABLE FOR MALES OF
DEVELOPING COUNTRIES - MORTALITY LEVEL 11 (WEST)

AGE	SURVIVORS AT AGE X OF 100000 BORN ALIVE	STATIONARY POPULATION IN AGE INTERVAL	WORKER RATE	STAT-IONARY LABOUR FORCE	CUMULATED MAN-YEARS IN LABOUR FORCE	WORKING LIFE EXPECTANCY AT AGE X
X	1X	LX	WX	LWX	TWX	EWX
(Crude Participation Rate = 20)						
10	73048.	361763.	0.0	0.0	2058076.0	28.174
15	71657.	353478.	0.0	0.0	2058076.0	28.721
20	69734.	342042.	69.8709	238987.6	2058076.0	29.513
25	67083.	1217548.	92.7970	1129847.0	1819089.0	27.117
45	53665.	489090.	87.8808	429816.0	689242.6	12.843
55	43713.	372411.	67.2033	250272.3	259426.6	5.935
65	30203.	305956.	2.9921	9154.4	9154.4	0.303
(CPR = 25)						
10	73048.	361763.	0.0	0.0	2144811.0	29.362
15	71657.	353478.	6.9938	24721.5	2144811.0	29.932
20	69734.	342042.	72.9579	249546.5	2120090.0	30.403
25	67083.	1217548.	93.4730	1138078.0	1870544.0	27.884
45	53665.	489090.	89.0858	435709.6	732466.8	13.649
55	43713.	372411.	70.2478	261610.4	296757.2	6.789
65	30203.	305956.	11.4875	35146.8	35146.8	1.164
(CPR = 30)						
10	73048.	361763.	0.0	0.0	2244227.0	30.723
15	71657.	353478.	17.5753	62124.8	2244227.0	31.319
20	69734.	342042.	76.0449	260105.3	2182103.0	31.292
25	67083.	1217548.	94.1490	1146308.0	1921998.0	28.651
45	53665.	489090.	90.2908	441603.2	775690.9	14.454
55	43713.	372411.	73.2923	272948.4	334087.8	7.643
65	30203.	305956.	19.9830	61139.3	61139.3	2.024
(CPR = 35)						
10	73048.	361763.	0.0	0.0	2343645.0	32.084
15	71657.	353478.	28.1568	99528.0	2343645.0	32.706
20	69734.	342042.	79.1319	270664.1	2244117.0	32.181
25	67083.	1217548.	94.8250	1154539.0	1973453.0	29.418
45	53665.	489090.	91.4958	447496.6	818914.9	15.260
55	43713.	372411.	76.3368	284286.5	371418.3	8.497
65	30203.	305956.	28.4785	87131.8	87131.8	2.885

AGE	SURVIVORS AT AGE X OF 100000 BORN ALIVE	STATIONARY POPULATION IN AGE INTERVAL	WORKER RATE	STAT- IONARY LABOUR FORCE	CUMULATED MAN-YEARS IN LABOUR FORCE	WORKING LIFE EXPECTANCY AT AGE X
X	1X	LX	WX	LWX	TWX	EWX

(CPR = 40)

10	73048.	361763.	0.0	0.0	2443063.0	33.445
15	71657.	353478.	38.7383	136931.3	2443063.0	34.094
20	69734.	342042.	82.2189	281223.0	2306132.0	33.070
25	67083.	1217548.	95.5010	1162770.0	2024909.0	30.185
45	53665.	489090.	92.7008	453390.2	862139.1	16.065
55	43713.	372411.	79.3813	295624.6	408748.9	9.351
65	30203.	305956.	36.9740	113124.3	113124.3	3.745

(CPR = 45)

10	73048.	361763.	2.3702	8574.5	2551052.0	34.923
15	71657.	353478.	49.3198	174334.5	2542478.0	35.481
20	69734.	342042.	85.3059	291781.9	2368144.0	33.960
25	67083.	1217548.	96.1770	1171000.0	2076363.0	30.952
45	53665.	489090.	93.9058	459283.6	905363.1	16.871
55	43713.	372411.	82.4258	306962.7	446079.4	10.205
65	30203.	305956.	45.4695	139116.8	139116.8	4.606

(CPR = 50)

10	73048.	361763.	5.0772	18367.4	2660262.0	36.418
15	71657.	353478.	59.9013	211737.8	2641895.0	36.869
20	69734.	342042.	88.3929	302340.6	2430158.0	34.849
25	67083.	1217548.	96.8530	1179231.0	2127818.0	31.719
45	53665.	489090.	95.1108	465177.3	948587.1	17.676
55	43713.	372411.	85.4703	318300.6	483409.9	11.059
65	30203.	305956.	53.9650	165109.3	165109.3	5.467

(CPR = 55)

10	73048.	361763.	7.7842	28160.3	2769472.0	37.913
15	71657.	353478.	70.4828	249140.9	2741312.0	38.256
20	69734.	342042.	91.4799	312899.5	2492172.0	35.738
25	67083.	1217548.	97.5290	1187462.0	2179273.0	32.486
45	53665.	489090.	96.3158	471070.7	991811.1	18.482
55	43713.	372411.	88.5148	329638.7	520740.4	11.913
65	30203.	305956.	62.4605	191101.8	191101.8	6.327

AGE	SURVIVORS AT AGE X OF 100000 BORN ALIVE	STATIONARY POPULATION IN AGE INTERVAL	WORKER RATE	STAT-IONARY LABOUR FORCE	CUMULATED MAN-YEARS IN LABOUR FORCE	WORKING LIFE EXPECTANCY AT AGE X
X	lX	LX	WX	LWX	TWX	EWX

(CPR = 60)

10	73048.	361763.	10.4912	37953.3	2878682.0	39.408
15	71657.	353478.	81.0643	286544.3	2840729.0	39.643
20	69734.	342042.	94.5669	323458.4	2554185.0	36.628
25	67083.	1217548.	98.2050	1195692.0	2230727.0	33.253
45	53665.	489090.	97.5208	476964.3	1035035.3	19.287
55	43713.	372411.	91.5593	340976.8	558070.9	12.767
65	30203.	305956.	70.9560	217094.2	217094.2	7.188

(CPR = 65)

10	73048.	361763.	13.1982	47746.2	2987892.0	40.903
15	71657.	353478.	91.6458	323947.5	2940146.0	41.031
20	69734.	342042.	97.6539	334017.3	2616199.0	37.517
25	67083.	1217548.	98.8810	1203923.0	2282182.0	34.020
45	53665.	489090.	98.7258	482857.9	1078259.0	20.092
55	43713.	372411.	94.6038	352314.9	595401.6	13.621
65	30203.	305956.	79.4515	243086.7	243086.7	8.048

(CPR = 70)

10	73048.	361763.	15.9052	57539.1	3086693.0	42.256
15	71657.	353478.	100.0000	353477.9	3029154.0	42.273
20	69734.	342042.	100.0000	342041.9	2675677.0	38.370
25	67083.	1217548.	99.5570	1212153.0	2333636.0	34.787
45	53665.	489090.	99.9308	488751.3	1121483.0	20.898
55	43713.	372411.	97.6483	363652.8	632731.9	14.475
65	30203.	305956.	87.9470	269079.2	269079.2	8.909

(CPR = 75)

10	73048.	361763.	18.6122	67332.0	3136970.0	42.944
15	71657.	353478.	100.0000	353477.9	3069638.0	42.838
20	69734.	342042.	100.0000	342041.9	2716161.0	38.950
25	67083.	1217548.	100.0000	1217548.0	2374120.0	35.391
45	53665.	489090.	100.0000	489089.9	1156572.0	21.552
55	43713.	372411.	100.0000	372410.9	667482.5	15.270
65	30203.	305956.	96.4425	295071.6	295071.6	9.770

Appendix B

110

Model Working Life Tables for Developing Countries

In this appendix, we present the working life tables
showing working life expectancy for various crude
participation rates and levels of mortality. The
method for using these tables has been indicated
with the examples in the main body of the thesis.

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPING COUNTRIES
MORTALITY LEVEL=7 (WEST)
(LIFE EXPECTANCY = 32.5)

AGE	CRUDE PARTICIPATION RATE					
	20.0	25.0	30.0	35.0	40.0	45.0
10	25.0	26.0	27.2	28.4	29.5	30.8
15	25.8	26.8	28.0	29.2	30.4	31.6
20	26.8	27.5	28.2	28.9	29.6	30.3
25	24.8	25.3	25.9	26.5	27.1	27.7
45	12.0	12.6	13.3	13.9	14.6	15.2
55	5.6	6.4	7.1	7.8	8.5	9.2
65	0.3	1.0	1.8	2.6	3.3	4.1

AGE	CRUDE PARTICIPATION RATE					
	50.0	55.0	60.0	65.0	70.0	75.0
10	32.1	33.4	34.7	36.0	37.1	37.7
15	32.8	34.0	35.2	36.3	37.4	37.8
20	31.0	31.7	32.4	33.1	33.8	34.2
25	28.3	28.9	29.4	30.0	30.6	31.1
45	15.9	16.5	17.2	17.8	18.5	19.0
55	10.0	10.7	11.4	12.1	12.8	13.5
65	4.9	5.6	6.4	7.1	7.9	8.7

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPING COUNTRIES
MORTALITY LEVEL=9 (WEST)
(LIFE EXPECTANCY = 37.3)

AGE	CRUDE PARTICIPATION RATE					
	20.0	25.0	30.0	35.0	40.0	45.0
10	26.7	27.7	29.0	30.3	31.5	32.9
15	27.3	28.4	29.7	31.0	32.3	33.6
20	28.2	29.0	29.8	30.6	31.4	32.2
25	26.0	26.7	27.3	28.0	28.7	29.4
45	12.4	13.2	13.9	14.6	15.3	16.1
55	5.8	6.6	7.4	8.2	8.9	9.7
65	0.3	1.1	1.9	2.7	3.5	4.4

AGE	CRUDE PARTICIPATION RATE					
	50.0	55.0	60.0	65.0	70.0	75.0
10	34.3	35.7	37.1	38.5	39.7	40.3
15	34.9	36.1	37.4	38.7	39.9	40.3
20	33.0	33.8	34.6	35.4	36.1	36.6
25	30.0	30.7	31.4	32.1	32.7	33.3
45	16.8	17.5	18.3	19.0	19.7	20.3
55	10.5	11.3	12.1	12.9	13.7	14.4
65	5.2	6.0	6.8	7.6	8.4	9.2

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPING COUNTRIES
MORTALITY   LEVEL=11 (WEST)
(LIFE EXPECTANCY = 42.1)

AGE	CRUDE PARTICIPATION RATE					
	20.0	25.0	30.0	35.0	40.0	45.0
10	28.2	29.4	30.7	32.1	33.4	34.9
15	28.7	29.9	31.3	32.7	34.1	35.5
20	29.5	30.4	31.3	32.2	33.1	34.0
25	27.1	27.9	28.7	29.4	30.2	31.0
45	12.8	13.6	14.5	15.3	16.1	16.9
55	5.9	6.8	7.6	8.5	9.4	10.2
65	0.3	1.2	2.0	2.9	3.7	4.6

AGE	CRUDE PARTICIPATION RATE					
	50.0	55.0	60.0	65.0	70.0	75.0
10	36.4	37.9	39.4	40.9	42.3	42.9
15	36.9	38.3	39.6	41.0	42.3	42.8
20	34.8	35.7	36.6	37.5	38.4	39.0
25	31.7	32.5	33.3	34.0	34.8	35.4
45	17.7	18.5	19.3	20.1	20.9	21.6
55	11.1	11.9	12.8	13.6	14.5	15.3
65	5.5	6.3	7.2	8.0	8.9	9.8

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPING COUNTRIES
MORTALITY   LEVEL=13 (WEST)
(LIFE EXPECTANCY = 47.1)

AGE	CRUDE PARTICIPATION RATE					
	20.0	25.0	30.0	35.0	40.0	45.0
10	29.6	30.9	32.4	33.8	35.3	36.9
15	30.1	31.4	32.9	34.4	35.9	37.3
20	30.7	31.7	32.7	33.7	34.7	35.7
25	28.2	29.0	29.9	30.8	31.6	32.5
45	13.2	14.1	15.0	15.9	16.8	17.6
55	6.1	7.0	7.9	8.8	9.7	10.7
65	0.3	1.2	2.1	3.0	3.9	4.9

AGE	CRUDE PARTICIPATION RATE					
	50.0	55.0	60.0	65.0	70.0	75.0
10	38.5	40.1	41.7	43.3	44.8	45.5
15	38.8	40.3	41.8	43.3	44.6	45.3
20	36.7	37.7	38.6	39.6	40.6	41.3
25	33.4	34.2	35.1	35.9	36.8	37.5
45	18.5	19.4	20.3	21.2	22.1	22.8
55	11.6	12.5	13.4	14.3	15.3	16.1
65	5.8	6.7	7.6	8.5	9.4	10.3

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPING COUNTRIES
MORTALITY LEVEL=15 (WEST)
(LIFE EXPECTANCY = 51.8)

AGE	CRUDE PARTICIPATION RATE					
	20.0	25.0	30.0	35.0	40.0	45.0
10	30.9	32.3	33.9	35.4	37.0	38.7
15	31.3	32.7	34.3	35.9	37.4	39.0
20	31.9	32.9	34.0	35.1	36.2	37.2
25	29.1	30.1	31.0	32.0	32.9	33.9
45	13.5	14.5	15.4	16.4	17.3	18.3
55	6.2	7.1	8.1	9.1	10.1	11.0
65	0.3	1.3	2.2	3.2	4.1	5.0

AGE	CRUDE PARTICIPATION RATE					
	50.0	55.0	60.0	65.0	70.0	75.0
10	40.4	42.1	43.8	45.5	47.0	47.9
15	40.6	42.2	43.8	45.4	46.8	47.5
20	38.3	39.4	40.5	41.6	42.6	43.3
25	34.8	35.8	36.7	37.7	38.6	39.4
45	19.2	20.2	21.1	22.1	23.0	23.8
55	12.0	13.0	13.9	14.9	15.9	16.8
65	6.0	6.9	7.9	8.8	9.8	10.7

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPING COUNTRIES
MORTALITY LEVEL=17 (WEST)
(LIFE EXPECTANCY = 56.5)

AGE	CRUDE PARTICIPATION RATE					
	20.0	25.0	30.0	35.0	40.0	45.0
10	32.2	33.7	35.3	37.0	38.7	40.5
15	32.5	34.0	35.7	37.3	39.0	40.7
20	32.9	34.1	35.3	36.4	37.6	38.8
25	30.0	31.1	32.1	33.2	34.2	35.3
45	13.8	14.9	15.9	16.9	17.9	19.0
55	6.3	7.3	8.3	9.4	10.4	11.4
65	0.3	1.3	2.3	3.3	4.3	5.3

AGE	CRUDE PARTICIPATION RATE					
	50.0	55.0	60.0	65.0	70.0	75.0
10	42.3	44.1	45.9	47.7	49.4	50.3
15	42.4	44.1	45.8	47.5	49.0	49.8
20	40.0	41.2	42.3	43.5	44.6	45.5
25	36.3	37.4	38.4	39.4	40.5	41.3
45	20.0	21.0	22.0	23.1	24.1	24.9
55	12.4	13.5	14.5	15.5	16.6	17.5
65	6.2	7.2	8.2	9.2	10.2	11.2

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPING COUNTRIES
MORTALITY   LEVEL=19 (WEST)
(LIFE EXPECTANCY = 61.2)

AGE	CRUDE PARTICIPATION RATE					
	20.0	25.0	30.0	35.0	40.0	45.0
10	33.4	35.0	36.8	38.6	40.4	42.3
15	33.6	35.3	37.0	38.8	40.6	42.4
20	34.0	35.3	36.5	37.8	39.1	40.4
25	31.0	32.1	33.2	34.4	35.5	36.7
45	14.2	15.3	16.4	17.5	18.6	19.7
55	6.4	7.5	8.6	9.7	10.8	11.8
65	0.4	1.4	2.4	3.5	4.5	5.5

AGE	CRUDE PARTICIPATION RATE					
	50.0	55.0	60.0	65.0	70.0	75.0
10	44.2	46.1	48.1	50.0	51.8	52.8
15	44.2	46.0	47.8	49.6	51.3	52.2
20	41.7	43.0	44.3	45.5	46.8	47.7
25	37.8	39.0	40.1	41.3	42.4	43.4
45	20.8	21.9	23.0	24.1	25.2	26.1
55	12.9	14.0	15.1	16.2	17.3	18.4
65	6.5	7.6	8.6	9.6	10.7	11.7

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPING COUNTRIES
MORTALITY LEVEL=21 (WEST)
(LIFE EXPECTANCY = 66.0)

AGE	CRUDE PARTICIPATION RATE					
	20.0	25.0	30.0	35.0	40.0	45.0
10	34.6	36.4	38.3	40.2	42.1	44.1
15	34.8	36.5	38.4	40.3	42.3	44.2
20	35.0	36.4	37.8	39.2	40.6	42.0
25	31.8	33.1	34.3	35.6	36.9	38.1
45	14.5	- 15.7	16.9	18.0	19.2	20.4
55	6.5	7.7	8.8	10.0	11.2	12.3
65	0.4	1.5	2.5	3.6	4.7	5.8

AGE	CRUDE PARTICIPATION RATE					
	50.0	55.0	60.0	65.0	70.0	75.0
10	46.2	48.2	50.3	52.3	54.2	55.4
15	46.1	48.0	49.9	51.9	53.6	54.7
20	43.4	44.8	46.2	47.6	49.0	50.0
25	39.4	40.6	41.9	43.2	44.4	45.5
45	21.6	22.8	24.0	25.2	26.4	27.4
55	13.5	14.7	15.8	17.0	18.2	19.3
65	6.9	7.9	9.0	10.1	11.2	12.3

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPING COUNTRIES
MORTALITY LEVEL=23 (WEST)
(LIFE EXPECTANCY = 71.2)

AGE	CRUDE PARTICIPATION RATE					
	20.0	25.0	30.0	35.0	40.0	45.0
10	35.9	37.8	39.9	42.0	44.1	46.3
15	36.0	37.9	40.0	42.1	44.2	46.3
20	36.1	37.7	39.3	40.8	42.4	44.0
25	32.8	34.2	35.6	37.1	38.5	39.9
45	14.9	16.2	17.6	18.9	20.2	21.6
55	6.6	7.9	9.2	10.5	11.8	13.1
65	0.4	1.6	2.8	3.9	5.1	6.3

AGE	CRUDE PARTICIPATION RATE					
	50.0	55.0	60.0	65.0	70.0	75.0
10	48.6	50.8	53.0	55.3	57.3	58.7
15	48.4	50.5	52.6	54.7	56.7	57.9
20	45.6	47.2	48.7	50.3	51.9	53.1
25	41.4	42.8	44.2	45.7	47.1	48.3
45	22.9	24.3	25.6	26.9	28.3	29.4
55	14.4	15.7	17.0	18.3	19.5	20.8
65	7.4	8.6	9.8	10.9	12.1	13.3

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPING COUNTRIES
MORTALITY LEVEL=7 (WEST)
(LIFE EXPECTANCY = 35.0)

AGE	CRUDE PARTICIPATION RATE					
	2.0	5.0	10.0	15.0	20.0	25.0
10	1.5	3.3	6.3	9.4	12.4	15.5
15	1.6	3.4	6.5	9.6	12.7	15.8
20	1.5	3.2	6.1	8.9	11.8	14.7
25	1.1	2.7	5.3	7.9	10.6	13.2
45	0.5	1.3	2.8	4.3	5.8	7.3
55	0.2	0.6	1.5	2.4	3.2	4.1
65	0.0	0.1	0.5	0.9	1.3	1.7

AGE	CRUDE PARTICIPATION RATE					
	30.0	35.0	40.0	45.0	50.0	55.0
10	18.5	21.6	24.7	27.7	30.8	33.8
15	18.9	22.0	25.1	28.2	31.3	34.4
20	17.6	20.4	23.3	26.2	29.1	32.0
25	15.8	18.5	21.1	23.7	26.4	29.0
45	8.8	10.2	11.7	13.2	14.7	16.2
55	4.9	5.8	6.7	7.5	8.4	9.2
65	2.1	2.5	2.9	3.3	3.7	4.1

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPING COUNTRIES
MORTALITY LEVEL=9 (WEST)
(LIFE EXPECTANCY = 40.0)

AGE	CRUDE PARTICIPATION RATE					
	2.0	5.0	10.0	15.0	20.0	25.0
10	1.6	3.5	6.7	10.0	13.2	16.5
15	1.6	3.6	6.9	10.1	13.4	16.7
20	1.5	3.3	6.4	9.4	12.5	15.5
25	1.2	2.8	5.6	8.4	11.1	13.9
45	0.5	1.4	2.9	4.5	6.0	7.6
55	0.2	0.7	1.6	2.5	3.4	4.3
65	0.0	0.2	0.6	1.0	1.4	1.8

AGE	CRUDE PARTICIPATION RATE					
	30.0	35.0	40.0	45.0	50.0	55.0
10	19.7	23.0	26.2	29.5	32.7	36.0
15	20.0	23.3	26.6	29.9	33.2	36.5
20	18.6	21.6	24.7	27.7	30.7	33.8
25	16.7	19.5	22.3	25.1	27.8	30.6
45	9.2	10.7	12.3	13.8	15.4	17.0
55	5.2	6.1	7.0	7.9	8.8	9.7
65	2.3	2.7	3.1	3.5	4.0	4.4

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPING COUNTRIES
MORTALITY LEVEL=11 (WEST)
(LIFE EXPECTANCY = 45.0)

AGE	CRUDE PARTICIPATION RATE					
	2.0	5.0	10.0	15.0	20.0	25.0
10	1.7	3.6	7.1	10.5	14.0	17.4
15	1.7	3.7	7.2	10.7	14.1	17.6
20	1.6	3.5	6.7	9.9	13.1	16.3
25	1.2	2.9	5.8	8.8	11.7	14.6
45	0.5	1.4	3.0	4.7	6.3	7.9
55	0.2	0.7	1.6	2.6	3.5	4.5
65	0.0	0.2	0.6	1.1	1.5	2.0

AGE	CRUDE PARTICIPATION RATE					
	30.0	35.0	40.0	45.0	50.0	55.0
10	20.9	24.3	27.7	31.2	34.6	38.1
15	21.1	24.5	28.0	31.5	34.9	38.4
20	19.5	22.7	25.9	29.1	32.3	35.5
25	17.5	20.5	23.4	26.3	29.2	32.2
45	9.6	11.2	12.8	14.4	16.1	17.7
55	5.4	6.4	7.4	8.3	9.3	10.2
65	2.4	2.9	3.3	3.7	4.2	4.6

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPING COUNTRIES
MORTALITY   LEVEL=13 (WEST)
(LIFE EXPECTANCY = 50.0)

AGE	CRUDE PARTICIPATION RATE					
	2.0	5.0	10.0	15.0	20.0	25.0
10	1.7	3.8	7.4	11.1	14.7	18.3
15	1.8	3.9	7.5	11.1	14.8	18.4
20	1.6	3.6	7.0	10.3	13.7	17.0
25	1.3	3.0	6.1	9.1	12.2	15.3
45	0.5	1.5	3.2	4.8	6.5	8.2
55	0.2	0.7	1.7	2.7	3.7	4.7
65	0.0	0.2	0.6	1.1	1.6	2.1

AGE	CRUDE PARTICIPATION RATE					
	30.0	35.0	40.0	45.0	50.0	55.0
10	21.9	25.6	29.2	32.8	36.4	40.0
15	22.1	25.7	29.3	33.0	36.6	40.2
20	20.4	23.8	27.1	30.5	33.8	37.2
25	18.3	21.4	24.4	27.5	30.6	33.6
45	9.9	11.6	13.3	15.0	16.7	18.4
55	5.7	6.7	7.7	8.7	9.7	10.7
65	2.5	3.0	3.5	4.0	4.4	4.9

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPING COUNTRIES
MORTALITY LEVEL=15 (WEST)
(LIFE EXPECTANCY = 55.0)

AGE	CRUDE PARTICIPATION RATE					
	2.0	5.0	10.0	15.0	20.0	25.0
10	1.8	4.0	7.8	11.5	15.3	19.1
15	1.8	4.0	7.8	11.6	15.4	19.2
20	1.7	3.7	7.2	10.7	14.2	17.7
25	1.3	3.1	6.3	9.5	12.7	15.8
45	0.5	1.5	3.2	5.0	6.7	8.5
55	0.2	0.7	1.8	2.8	3.8	4.9
65	0.0	0.2	0.7	1.2	1.7	2.2

AGE	CRUDE PARTICIPATION RATE					
	30.0	35.0	40.0	45.0	50.0	55.0
10	22.9	26.7	30.5	34.3	38.1	41.9
15	23.0	26.7	30.5	34.3	38.1	41.9
20	21.2	24.7	28.2	31.7	35.2	38.7
25	19.0	22.2	25.4	28.6	31.7	34.9
45	10.2	12.0	13.7	15.5	17.2	19.0
55	5.9	6.9	7.9	9.0	10.0	11.0
65	2.7	3.2	3.6	4.1	4.6	5.1

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPING COUNTRIES
MORTALITY LEVEL=17 (WEST)
(LIFE EXPECTANCY = 60.0)

AGE	CRUDE PARTICIPATION RATE					
	2.0	5.0	10.0	15.0	20.0	25.0
10	1.8	4.1	8.1	12.0	16.0	20.0
15	1.9	4.1	8.1	12.1	16.0	20.0
20	1.7	3.8	7.5	11.1	14.8	18.4
25	1.3	3.2	6.5	9.8	13.1	16.5
45	0.5	1.5	3.3	5.2	7.0	8.8
55	0.2	0.7	1.8	2.9	4.0	5.0
65	0.0	0.2	0.7	1.2	1.7	2.3

AGE	CRUDE PARTICIPATION RATE					
	30.0	35.0	40.0	45.0	50.0	55.0
10	23.9	27.9	31.9	35.8	39.8	43.8
15	23.9	27.9	31.8	35.8	39.7	43.7
20	22.1	25.7	29.3	33.0	36.6	40.3
25	19.8	23.1	26.4	29.7	33.0	36.3
45	10.6	12.4	14.2	16.0	17.8	19.6
55	6.1	7.2	8.2	9.3	10.4	11.5
65	2.8	3.3	3.8	4.3	4.9	5.4

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPING COUNTRIES
MORTALITY LEVEL=19 (WEST)
(LIFE EXPECTANCY = 65.0)

AGE	CRUDE PARTICIPATION RATE					
	2.0	5.0	10.0	15.0	20.0	25.0
10	1.9	4.3	8.4	12.5	16.7	20.8
15	1.9	4.3	8.4	12.5	16.6	20.7
20	1.8	3.9	7.7	11.5	15.3	19.1
25	1.4	3.3	6.8	10.2	13.6	17.1
45	0.5	1.6	3.4	5.3	7.2	9.1
55	0.2	0.8	1.9	3.0	4.1	5.2
65	0.0	0.2	0.7	1.3	1.8	2.4

AGE	CRUDE PARTICIPATION RATE					
	30.0	35.0	40.0	45.0	50.0	55.0
10	25.0	29.1	33.2	37.4	41.5	45.7
15	24.9	29.0	33.1	37.2	41.3	45.4
20	22.9	26.7	30.5	34.3	38.1	41.9
25	20.5	23.9	27.4	30.8	34.2	37.7
45	10.9	12.8	14.7	16.6	18.4	20.3
55	6.3	7.5	8.6	9.7	10.8	11.9
65	2.9	3.5	4.0	4.6	5.1	5.7

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPING COUNTRIES
MORTALITY LEVEL=21 (WEST)
(LIFE EXPECTANCY = 70.0)

AGE	CRUDE PARTICIPATION RATE					
	2.0	5.0	10.0	15.0	20.0	25.0
10	1.9	4.4	8.7	13.0	17.3	21.7
15	2.0	4.4	8.7	13.0	17.2	21.5
20	1.8	4.1	8.0	11.9	15.9	19.8
25	1.4	3.4	7.0	10.6	14.1	17.7
45	0.6	1.6	3.6	5.5	7.4	9.4
55	0.2	0.8	2.0	3.1	4.3	5.4
65	0.0	0.2	0.8	1.4	1.9	2.5

AGE	CRUDE PARTICIPATION RATE					
	30.0	35.0	40.0	45.0	50.0	55.0
10	26.0	30.3	34.6	38.9	43.2	47.5
15	25.8	30.1	34.4	38.6	42.9	47.2
20	23.8	27.7	31.6	35.6	39.5	43.5
25	21.3	24.8	28.4	32.0	35.5	39.1
45	11.3	13.3	15.2	17.2	19.1	21.0
55	6.6	7.8	8.9	10.1	11.3	12.4
65	3.1	3.7	4.2	4.8	5.4	6.0

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPING COUNTRIES
MORTALITY   LEVEL=23 (WEST)
(LIFE EXPECTANCY = 75.0)

AGE	CRUDE PARTICIPATION RATE					
	2.0	5.0	10.0	15.0	20.0	25.0
10	2.0	4.5	9.0	13.6	18.1	22.6
15	2.0	4.5	9.0	13.5	17.9	22.4
20	1.8	4.2	8.3	12.4	16.5	20.6
25	1.4	3.5	7.3	11.0	14.7	18.4
45	0.6	1.7	3.7	5.8	7.8	9.9
55	0.2	0.8	2.1	3.3	4.5	5.8
65	0.0	0.2	0.9	1.5	2.1	2.7

AGE	CRUDE PARTICIPATION RATE					
	30.0	35.0	40.0	45.0	50.0	55.0
10	27.1	31.6	36.1	40.6	45.1	49.6
15	26.9	31.3	35.8	40.2	44.7	49.2
20	24.8	28.9	33.0	37.1	41.2	45.3
25	22.2	25.9	29.6	33.4	37.1	40.8
45	11.9	13.9	16.0	18.0	20.1	22.1
55	7.0	8.3	9.5	10.7	12.0	13.2
65	3.4	4.0	4.6	5.2	5.9	6.5

Appendix C

Model Working Life Tables for Developed Countries

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=19 (NORTH)
(LIFE EXPECTANCY = 61.3)

AGE	CRUDE PARTICIPATION RATE		
	56.0	57.0	59.0
15	39.1	40.7	42.4
20	37.4	38.8	40.2
25	33.9	35.3	36.6
45	17.0	18.3	19.6
55	8.8	10.1	11.5
65	2.5	3.5	4.5

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=21 (NORTH)
(LIFE EXPECTANCY = 66.4)

AGE	CRUDE PARTICIPATION RATE		
	56.0	57.0	59.0
15	40.4	42.2	44.0
20	38.6	40.1	41.7
25	35.0	36.4	37.9
45	17.5	18.9	20.4
55	9.1	10.5	11.9
65	2.6	3.7	4.8

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=23 (NORTH)
(LIFE EXPECTANCY = 71.6)

AGE	CRUDE PARTICIPATION RATE		
	56.0	57.0	59.0
15	41.9	43.8	45.8
20	40.0	41.6	43.3
25	36.2	37.8	39.4
45	18.1	19.6	21.2
55	9.4	11.0	12.5
65	2.8	4.0	5.2

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=24 (NORTH)
(LIFE EXPECTANCY = 74.4)

AGE	CRUDE PARTICIPATION RATE		
	56.0	57.0	59.0
15	42.7	44.8	46.9
20	40.7	42.5	44.4
25	36.9	38.6	40.3
45	18.5	20.1	21.8
55	9.7	11.3	12.9
65	3.0	4.2	5.5

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=19 (SOUTH)
(LIFE EXPECTANCY = 61.2)

AGE	CRUDE PARTICIPATION RATE		
	56.0	57.0	59.0
15	40.3	42.0	43.7
20	38.4	39.8	41.3
25	34.7	36.0	37.3
45	17.0	18.3	19.6
55	8.7	10.0	11.3
65	2.4	3.4	4.4

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=21 (SOUTH)
(LIFE EXPECTANCY = 66.1)

AGE	CRUDE PARTICIPATION RATE		
	56.0	57.0	59.0
15	41.5	43.4	45.2
20	39.6	41.1	42.7
25	35.7	37.1	38.6
45	17.5	18.9	20.3
55	9.0	10.4	11.8
65	2.6	3.6	4.7

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPED   COUNTRIES
MORTALITY LEVEL=23 (SOUTH)
(LIFE EXPECTANCY = 71.0)

AGE	CRUDE PARTICIPATION RATE		
	56.0	57.0	59.0
15	42.8	44.8	46.8
20	40.7	42.4	44.2
25	36.7	38.3	40.0
45	18.1	19.7	21.2
55	9.4	10.9	12.4
65	2.8	3.9	5.1

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPED   COUNTRIES
MORTALITY LEVEL=24 (SOUTH)
(LIFE EXPECTANCY = 73.6)

AGE	CRUDE PARTICIPATION RATE		
	56.0	57.0	59.0
15	43.4	45.5	47.6
20	41.3	43.1	44.9
25	37.2	39.0	40.7
45	18.5	20.1	21.7
55	9.6	11.2	12.8
65	2.9	4.1	5.4

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=19 (EAST)
(LIFE EXPECTANCY = 60.7)

AGE	CRUDE PARTICIPATION RATE		
	56.0	57.0	59.0
15	39.4	41.0	42.6
20	37.6	38.9	40.2
25	34.0	35.2	36.4
45	16.5	17.7	18.9
55	8.3	9.5	10.7
65	2.2	3.1	4.1

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=21 (EAST)
(LIFE EXPECTANCY = 65.3)

AGE	CRUDE PARTICIPATION RATE		
	56.0	57.0	59.0
15	40.5	42.2	43.9
20	38.6	40.0	41.4
25	34.9	36.2	37.5
45	16.9	18.2	19.4
55	8.6	9.8	11.1
65	2.3	3.3	4.3

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=23 (EAST)
(LIFE EXPECTANCY = 70.2)

AGE	CRUDE PARTICIPATION RATE		
	56.0	57.0	59.0
15	41.9	43.7	45.5
20	39.8	41.4	43.0
25	35.9	37.4	38.8
45	17.5	18.9	20.3
55	8.9	10.3	11.6
65	2.5	3.6	4.6

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR MALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=24 (EAST)
(LIFE EXPECTANCY = 72.7)

AGE	CRUDE PARTICIPATION RATE		
	56.0	57.0	59.0
15	42.6	44.5	46.4
20	40.5	42.2	43.8
25	36.5	38.1	39.6
45	17.9	19.3	20.8
55	9.1	10.6	12.0
65	2.6	3.7	4.8

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=17 (NORTH)
(LIFE EXPECTANCY = 60.0)

AGE	CRUDE PARTICIPATION RATE					
	10.0	15.0	20.0	25.0	30.0	35.0
20	5.2	8.7	12.2	15.7	19.1	22.6
25	3.2	6.5	9.8	13.1	16.4	19.7
45	1.8	3.3	4.9	6.4	7.9	9.5
55	1.1	1.8	2.4	3.1	3.7	4.4
65	0.1	0.4	0.6	0.9	1.1	1.3

AGE	CRUDE PARTICIPATION RATE					
	40.0	45.0	50.0	55.0	60.0	65.0
20	26.1	29.6	33.1	36.6	38.1	38.9
25	23.0	26.3	29.6	32.9	34.3	34.8
45	11.0	12.5	14.1	15.6	16.7	17.3
55	5.0	5.7	6.4	7.0	7.7	8.3
65	1.6	1.8	2.1	2.3	2.5	2.8

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPED   COUNTRIES
MORTALITY LEVEL=19 (NORTH)
(LIFE EXPECTANCY = 65.0)

AGE	CRUDE PARTICIPATION RATE					
	10.0	15.0	20.0	25.0	30.0	35.0
20	5.3	8.9	12.5	16.1	19.7	23.3
25	3.3	6.7	10.1	13.5	16.9	20.3
45	1.9	3.4	5.0	6.6	8.1	9.7
55	1.1	1.8	2.5	3.2	3.9	4.5
65	0.2	0.4	0.7	0.9	1.2	1.4

AGE	CRUDE PARTICIPATION RATE					
	40.0	45.0	50.0	55.0	60.0	65.0
20	26.9	30.5	34.1	37.6	39.3	40.1
25	23.7	27.1	30.5	33.8	35.3	35.9
45	11.3	12.9	14.4	16.0	17.1	17.7
55	5.2	5.9	6.6	7.2	7.9	8.6
65	1.7	1.9	2.2	2.4	2.7	3.0

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=21 (NORTH)
(LIFE EXPECTANCY = 70.0)

AGE	CRUDE PARTICIPATION RATE					
	10.0	15.0	20.0	25.0	30.0	35.0
20	5.4	9.1	12.8	16.5	20.2	23.9
25	3.4	6.9	10.4	13.9	17.3	20.8
45	1.9	3.5	5.1	6.7	8.3	10.0
55	1.2	1.9	2.6	3.3	4.0	4.7
65	0.2	0.4	0.7	1.0	1.2	1.5

AGE	CRUDE PARTICIPATION RATE					
	40.0	45.0	50.0	55.0	60.0	65.0
20	27.6	31.3	35.0	38.7	40.4	41.3
25	24.3	27.8	31.3	34.8	36.2	36.9
45	11.6	13.2	14.8	16.4	17.5	18.2
55	5.4	6.1	6.8	7.5	8.2	8.9
65	1.8	2.1	2.3	2.6	2.9	3.1

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=23 (NORTH)
(LIFE EXPECTANCY = 75.0)

AGE	CRUDE PARTICIPATION RATE					
	10.0	15.0	20.0	25.0	30.0	35.0
20	5.5	9.4	13.2	17.0	20.8	24.6
25	3.5	7.1	10.7	14.3	17.8	21.4
45	2.0	3.6	5.3	6.9	8.6	10.2
55	1.2	1.9	2.7	3.4	4.1	4.9
65	0.2	0.5	0.8	1.0	1.3	1.6

AGE	CRUDE PARTICIPATION RATE					
	40.0	45.0	50.0	55.0	60.0	65.0
20	28.4	32.2	36.0	39.8	41.6	42.5
25	25.0	28.6	32.2	35.7	37.3	38.0
45	11.9	13.5	15.2	16.9	18.0	18.8
55	5.6	6.3	7.1	7.8	8.5	9.3
65	1.9	2.2	2.5	2.8	3.1	3.4

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=24 (NORTH)
(LIFE EXPECTANCY = 77.5)

AGE	CRUDE PARTICIPATION RATE					
	10.0	15.0	20.0	25.0	30.0	35.0
20	5.6	9.5	13.3	17.2	21.1	24.9
25	3.6	7.2	10.8	14.5	18.1	21.7
45	2.0	3.7	5.4	7.0	8.7	10.4
55	1.2	2.0	2.7	3.5	4.2	5.0
65	0.2	0.5	0.8	1.1	1.4	1.7

AGE	CRUDE PARTICIPATION RATE					
	40.0	45.0	50.0	55.0	60.0	65.0
20	28.8	32.7	36.5	40.4	42.2	43.2
25	25.4	29.0	32.6	36.3	37.9	38.6
45	12.1	13.8	15.5	17.2	18.4	19.1
55	5.7	6.5	7.3	8.0	8.8	9.5
65	2.0	2.3	2.6	2.9	3.2	3.5

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=17 (SOUTH)
(LIFE EXPECTANCY = 60.0)

AGE	CRUDE PARTICIPATION RATE					
	10.0	15.0	20.0	25.0	30.0	35.0
20	5.3	8.9	12.5	16.1	19.6	23.2
25	3.3	6.7	10.1	13.5	16.8	20.2
45	1.9	3.4	5.0	6.5	8.1	9.6
55	1.1	1.8	2.4	3.1	3.8	4.4
65	0.1	0.4	0.6	0.9	1.1	1.3

AGE	CRUDE PARTICIPATION RATE					
	40.0	45.0	50.0	55.0	60.0	65.0
20	26.8	30.4	34.0	37.6	39.2	40.0
25	23.6	27.0	30.4	33.8	35.2	35.8
45	11.2	12.8	14.3	15.9	17.0	17.6
55	5.1	5.8	6.4	7.1	7.7	8.4
65	1.6	1.8	2.0	2.3	2.5	2.7

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=19 (SOUTH)
(LIFE EXPECTANCY = 65.0)

AGE	CRUDE PARTICIPATION RATE					
	10.0	15.0	20.0	25.0	30.0	35.0
20	5.4	9.1	12.8	16.5	20.2	23.9
25	3.4	6.9	10.3	13.8	17.3	20.8
45	1.9	3.5	5.1	6.7	8.3	9.9
55	1.1	1.8	2.5	3.2	3.9	4.6
65	0.2	0.4	0.7	0.9	1.2	1.4

AGE	CRUDE PARTICIPATION RATE					
	40.0	45.0	50.0	55.0	60.0	65.0
20	27.5	31.2	34.9	38.6	40.3	41.2
25	24.2	27.7	31.2	34.7	36.1	36.7
45	11.5	13.1	14.7	16.3	17.4	18.0
55	5.3	6.0	6.6	7.3	8.0	8.7
65	1.7	1.9	2.2	2.4	2.7	2.9

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=21 (SOUTH)
(LIFE EXPECTANCY = 70.0)

AGE	CRUDE PARTICIPATION RATE					
	10.0	15.0	20.0	25.0	30.0	35.0
20	5.5	9.3	13.1	16.9	20.7	24.5
25	3.5	7.0	10.6	14.2	17.7	21.3
45	1.9	3.6	5.2	6.9	8.5	10.1
55	1.2	1.9	2.6	3.3	4.0	4.8
65	0.2	0.4	0.7	1.0	1.3	1.5

AGE	CRUDE PARTICIPATION RATE					
	40.0	45.0	50.0	55.0	60.0	65.0
20	28.2	32.0	35.8	39.6	41.4	42.3
25	24.8	28.4	32.0	35.5	37.1	37.7
45	11.8	13.4	15.1	16.7	17.9	18.6
55	5.5	6.2	6.9	7.6	8.4	9.1
65	1.8	2.1	2.4	2.6	2.9	3.2

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=23 (SOUTH)
(LIFE EXPECTANCY = 75.0)

AGE	CRUDE PARTICIPATION RATE					
	10.0	15.0	20.0	25.0	30.0	35.0
20	5.6	9.5	13.4	17.3	21.1	25.0
25	3.6	7.2	10.9	14.5	18.2	21.8
45	2.0	3.7	5.4	7.1	8.8	10.4
55	1.2	2.0	2.7	3.5	4.2	5.0
65	0.2	0.5	0.8	1.1	1.4	1.7

AGE	CRUDE PARTICIPATION RATE					
	40.0	45.0	50.0	55.0	60.0	65.0
20	28.9	32.8	36.7	40.5	42.4	43.3
25	25.4	29.1	32.7	36.4	38.0	38.7
45	12.1	13.8	15.5	17.2	18.4	19.2
55	5.7	6.5	7.3	8.0	8.8	9.5
65	2.0	2.3	2.6	2.9	3.2	3.5

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=24 (SOUTH)
(LIFE EXPECTANCY = 77.5)

AGE	CRUDE PARTICIPATION RATE					
	10.0	15.0	20.0	25.0	30.0	35.0
20	5.7	9.6	13.5	17.4	21.4	25.3
25	3.6	7.3	11.0	14.7	18.4	22.1
45	2.0	3.7	5.5	7.2	8.9	10.6
55	1.2	2.0	2.8	3.6	4.3	5.1
65	0.2	0.5	0.8	1.1	1.5	1.8

AGE	CRUDE PARTICIPATION RATE					
	40.0	45.0	50.0	55.0	60.0	65.0
20	29.2	33.1	37.1	41.0	42.9	43.9
25	25.7	29.4	33.1	36.8	38.4	39.2
45	12.3	14.1	15.8	17.5	18.7	19.5
55	5.9	6.7	7.4	8.2	9.0	9.8
65	2.1	2.4	2.7	3.0	3.4	3.7

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=17 (EAST)
(LIFE EXPECTANCY = 60.0)

AGE	CRUDE PARTICIPATION RATE					
	10.0	15.0	20.0	25.0	30.0	35.0
20	5.2	8.8	12.3	15.8	19.4	22.9
25	3.2	6.6	9.9	13.2	16.6	19.9
45	1.8	3.3	4.8	6.4	7.9	9.4
55	1.1	1.7	2.4	3.0	3.6	4.3
65	0.1	0.4	0.6	0.8	1.0	1.2

AGE	CRUDE PARTICIPATION RATE					
	40.0	45.0	50.0	55.0	60.0	65.0
20	26.4	29.9	33.5	37.0	38.6	39.4
25	23.2	26.6	29.9	33.2	34.6	35.1
45	10.9	12.4	14.0	15.5	16.5	17.1
55	4.9	5.5	6.2	6.8	7.5	8.1
65	1.5	1.7	1.9	2.1	2.4	2.6

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=19 (EAST)
(LIFE EXPECTANCY = 65.0)

AGE	CRUDE PARTICIPATION RATE					
	10.0	15.0	20.0	25.0	30.0	35.0
20	5.4	9.0	12.6	16.2	19.9	23.5
25	3.3	6.8	10.2	13.6	17.0	20.4
45	1.9	3.4	5.0	6.5	8.1	9.6
55	1.1	1.8	2.4	3.1	3.8	4.4
65	0.1	0.4	0.6	0.9	1.1	1.3

AGE	CRUDE PARTICIPATION RATE					
	40.0	45.0	50.0	55.0	60.0	65.0
20	27.1	30.8	34.4	38.0	39.7	40.5
25	23.8	27.3	30.7	34.1	35.5	36.1
45	11.2	12.7	14.3	15.8	16.9	17.6
55	5.1	5.7	6.4	7.0	7.7	8.4
65	1.6	1.8	2.0	2.3	2.5	2.7

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=21 (EAST)
(LIFE EXPECTANCY = 70.0)

AGE	CRUDE PARTICIPATION RATE					
	10.0	15.0	20.0	25.0	30.0	35.0
20	5.5	9.2	12.9	16.7	20.4	24.1
25	3.4	6.9	10.4	13.9	17.4	20.9
45	1.9	3.5	5.1	6.7	8.3	9.9
55	1.1	1.8	2.5	3.2	3.9	4.6
65	0.2	0.4	0.7	0.9	1.2	1.4

AGE	CRUDE PARTICIPATION RATE					
	40.0	45.0	50.0	55.0	60.0	65.0
20	27.8	31.6	35.3	39.0	40.7	41.6
25	24.4	28.0	31.5	35.0	36.4	37.1
45	11.5	13.1	14.6	16.2	17.4	18.0
55	5.2	5.9	6.6	7.3	8.0	8.7
65	1.7	1.9	2.2	2.4	2.7	2.9

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=23 (EAST)
(LIFE EXPECTANCY = 75.0)

AGE	CRUDE PARTICIPATION RATE					
	10.0	15.0	20.0	25.0	30.0	35.0
20	5.6	9.4	13.2	17.1	20.9	24.7
25	3.5	7.1	10.7	14.3	17.9	21.5
45	2.0	3.6	5.3	6.9	8.5	10.2
55	1.2	1.9	2.6	3.3	4.1	4.8
65	0.2	0.4	0.7	1.0	1.3	1.6

AGE	CRUDE PARTICIPATION RATE					
	40.0	45.0	50.0	55.0	60.0	65.0
20	28.6	32.4	36.2	40.1	41.9	42.8
25	25.1	28.7	32.3	35.9	37.5	38.2
45	11.8	13.5	15.1	16.8	18.0	18.7
55	5.5	6.2	7.0	7.7	8.4	9.1
65	1.8	2.1	2.4	2.7	2.9	3.2

EXPECTATION OF WORKING LIFE IN A MODEL
WORKING LIFE TABLE FOR FEMALES OF
DEVELOPED COUNTRIES
MORTALITY LEVEL=24 (EAST)
(LIFE EXPECTANCY = 77.5)

AGE	CRUDE PARTICIPATION RATE					
	10.0	15.0	20.0	25.0	30.0	35.0
20	5.6	9.5	13.4	17.3	21.2	25.1
25	3.6	7.2	10.9	14.5	18.2	21.8
45	2.0	3.7	5.3	7.0	8.7	10.4
55	1.2	1.9	2.7	3.4	4.2	4.9
65	0.2	0.5	0.8	1.1	1.4	1.6

AGE	CRUDE PARTICIPATION RATE					
	40.0	45.0	50.0	55.0	60.0	65.0
20	28.9	32.8	36.7	40.6	42.4	43.4
25	25.5	29.1	32.8	36.4	38.0	38.7
45	12.1	13.8	15.4	17.1	18.3	19.1
55	5.7	6.4	7.2	7.9	8.7	9.4
65	1.9	2.2	2.5	2.8	3.1	3.4